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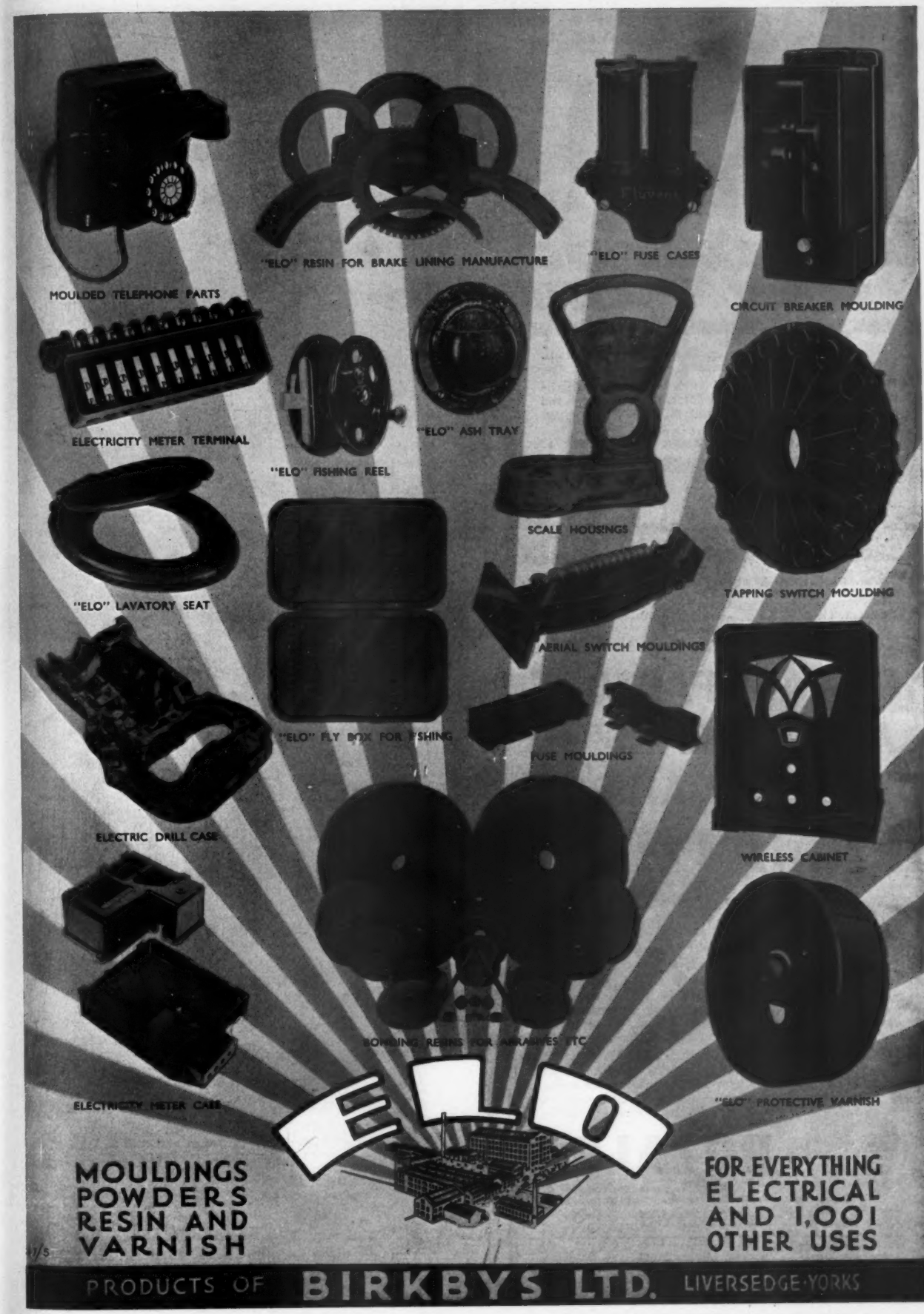
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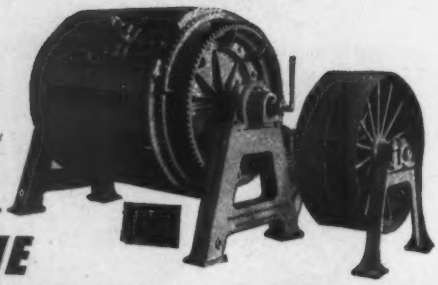

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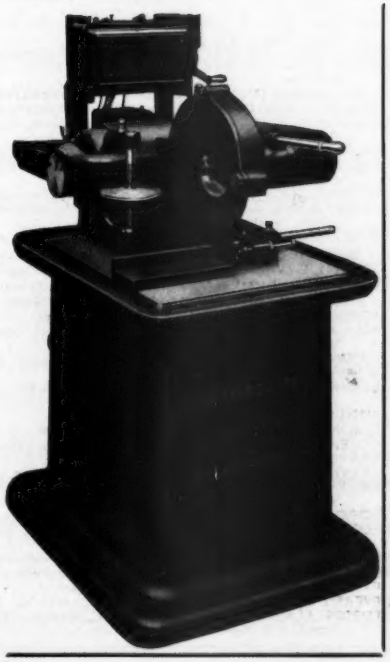

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THINK IT OVER

In recent advertisements we have tried to expose some current weaknesses of the Plastics Industry and the danger of allowing them to continue. That careful planning and a policy directed beyond the immediate future are merited is clear from the rate of growth and progress in its hitherto short life

Let us stop a moment to consider . . . Within 12 years the cost of the Industry's principal materials has been reduced by fifty to seventy per cent, with a reduction in fabricating costs of the same order.

A round dozen distinct types of materials have been developed from different chemical combinations, each differing in basic properties, and these again are available in a wide variety of grades. Mouldings are made in sizes from small buttons up to coffins and sheets of wall panelling of more than giant's stature and of corresponding breadth. Important developments have taken place in all three methods of moulding — extrusion, injection and compression.

These are some of the advances in the Plastics Industry within the recent memory of most of us who are actively engaged in it today. As a result, plastic products have entered and become well-nigh indispensable in almost every phase of social and industrial life. We owe it to the many industries that now depend upon us, as well as ourselves, that such a record is continued without slur or blemish.

ISSUED IN THE INTERESTS OF BOTH PRODUCERS AND USERS OF PLASTICS BY BRITISH INDUSTRIAL PLASTICS LTD
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Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials.

Vol. III. SEPTEMBER, 1939 No. 28

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"PLASTICS" is published in London, England, at the beginning of each month.

Head Offices: Bowling Green Lane, London, E.C.1.
Inland Telegrams: "*Pressimus, Smith, London.*"
Cables - - "*Pressimus, London.*"
Telephone - *Terminus 3636 (Private Exchange).*

Midland Offices — Birmingham: 61/65, New Street.
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Telegrams—"*Presswork, Manchester.*"

SUBSCRIPTION—"PLASTICS" will be mailed regularly to any address in the United Kingdom or abroad for—
Twelve issues for 15s. post free; Canada and Newfoundland 12 for 13s. 6d.; pro rata for fewer numbers.

COMMUNICATIONS—All letters regarding subscriptions, advertisements and other business matters must be addressed to The Manager, Bowling Green Lane, London, E.C.1.

TEMPLE PRESS LIMITED
Proprietors, Printers and Publishers of "The Motor," "The Light Car," "The Commercial Motor," "Motor Cycling," "Cycling," "The Motor Ship," "The Motor Boat and Yachting," "The Oil Engine," "The Aeroplane" and "Light Metals."
Bowling Green Lane, London, E.C.1.

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THE MATERIAL OF INFINITE USES

Vol. III. No. 28 SEPTEMBER, 1939

Plastics

Dealing with the Manufacture, Uses and Potentialities of Plastic Materials

Proprietors - - TEMPLE PRESS LIMITED
Managing Director - ROLAND E. DANGERFIELD

Editor - - M. D. CURWEN, B.Sc., A.I.C.
Offices - Bowling Green Lane, London, E.C.1

STAND FAST

I am writing this on Sunday, September 3rd, a few hours after war was declared on Germany. I have just heard the King's message to his people and the speech of the Prime Minister, both of them calm, determined and without the slightest trace of bombast . . . . two speeches which will give us courage in future trials and show us how just is the action we have taken. They left no doubt in anyone's mind that the fight is against the dark forces of barbarity and oppression and against the enemies of civilization as we know it.

Stand fast and carry on must be the guiding rules of us all. The first we believe already inherent in the British character. As for the second, we remember the 1914 war slogan of "Business as Usual," and although the situation is vastly different now we shall carry on as best we can.

In these days of severe trial, we are convinced that the plastics industry, born of chemical, physical and engineering science, will play its part. It will orientate itself to the needs of the times and acquit itself nobly. As for this journal we shall continue to the best of our ability, limiting our space to accord with the times and serving the industry as best we can.

We convey our best wishes to all.

The Editor

Bouquets and Brickbats

IT may be regarded by some as an inappropriate time to continue the discussion of the subject we raised in our last month's editorial—industrial suicide. On the other hand, it appears singularly appropriate for many types of manufacture will go by the board for the time being, and perhaps Government work will be in the ascendency and of prime importance regarding quality. Let the Plastics Industry remember that it is a golden opportunity for turning out first-class work, although admittedly under difficult conditions and, moreover, that first-class work is most essential to the well-being of the Fighting Forces. We do not believe that anyone will consider it, in the rush days that follow urgent calls for deliveries, an occasion for inferior goods of any type.

Following our editorial we wrote to a number of concerns in the plastics industry to obtain their views. The replies are most interesting. By far the largest proportion agreed heartily with the sentiments we expressed, and some of these answers we are publishing on another page in this issue. Other answers we are holding over until our next issue.

In view of the general trend of our remarks, it is as important to obtain the views of those who disagree with them as those who agree. It is a pity that the two important concerns who sent in opposing answers insisted that they were not for publication. Some of their general remarks, however, would not be contravening their desire. One infers that we are not fair to the British Plastics Federation by referring begrudgingly to its efforts in the past. We must point out very strongly that we value much of the work it has carried out. We believe that its potential powers are great and merely desire acceleration of action and not to pose as mentors able or willing to teach it or the industry the best method of sucking eggs. If price-cutting were of very recent growth we should rather have regarded it as a passing phase, but ruthless price-cutting resulting in uneconomic and unprofitable production has been rampant for many years. Indeed, it had grown to such dimensions that over eight years ago James Ferguson and Son, Ltd., who produce world-famous synthetic resins, were so concerned regarding the state of the industry, had the courage to put a remarkable advertisement in *British Plastics* drawing attention to the price-cutting ramp. This advertisement contained the following sentences:—"Somebody should start talking plainly in the moulding business. The brutal truth of the matter is that within five years the number of moulders who can actually call their souls their own will be limited to those who are now (and at that time will be) moulding quality mouldings at a profit. . . . The price-cutting ramp to the buyer of mouldings still goes on. The accrued advantages of low material costs, tool designs, etc., are all given away. We do sincerely ask you all, before you put that next 'quote' in, to soliloquize on these lines:—That the job is a good one. Materials of the best; it is worthy of our industry. Are the costs right? . . . Then we ought to get a fair price for it which will give us a reasonable margin."

This, gentlemen, was over eight years ago. Can any lay his hand on his heart and say that things have changed for the better?

From the second letter which disagreed with our views we extract the following:—". . . Our actual experience does not support your views to any extent. There is a certain amount of price-cutting, and there always will be, but that this, with consequent lowering in quality, has been the means of discrediting the industry is something we do not agree with. . . . Any new industry . . . has its teething troubles, and the plastics industry is no exception; but if one compares the state of the industry to-day with what it was 10 years ago you cannot help but admit that tremendous progress has been made, and there is every indication that this development is progressing favourably."

How well do we know that the industry has progressed favourably—chemically, physically and from an engineering point of view. We are not, however, concerned with these. Is the economic health of the industry progressing favourably? Our own personal view is that its teething troubles have continued too long, and that what is wanted is more calcium or hormone or whatever it is they give infants nowadays.

What is wanted, too, other than moral teaching of the evils of poor quality goods in response to price-cutting, is a lesson in factory economics. We all know the terrible temptation to maintain unemployed presses at all costs, but there is also a very strong suspicion that the ability to estimate real moulding costs is often very weak.

That the trouble is not confined to this country is confirmed by a letter from Mr. D. A. Dearle, whose articles from America we have published from time to time. He sends one entitled "Overheads," which is published on another page in this issue. His letter says: "In submitting the enclosed manuscript for your consideration, I am prompted chiefly by your excellent editorial in the September issue of *Plastics*. It is apparent that you are beset with much the same problem as we are in the States and it would seem that any frank discourse on possible causes of our predicament might help to alleviate the condition."

Our New Headquarters

LAST month we moved. We have left the offices and printing works in Rosebery Avenue, where the journals of Temple Press Ltd. have been edited, printed and published for 37 years, and are now installed in an entirely modern building in Bowling Green Lane. We are still in the London postal district of E.C.1, about 500 yards from our former premises, but in quieter surroundings, in a part of Finsbury which is being developed as a new commercial centre.

The building has been planned to an ideal. The latest air-conditioning system provides a constant change of pure air, maintained at a uniform temperature. Each window is glazed with three types of glass, including Thermolux, for the even distribution of light, and there is greater window area than wall. The offices are simple in design and furnishing, planned for efficiency. The machine room, with the most modern printing plant, is lofty. There are many devices for avoiding waste labour and everything to promote an even flow of work under first-class conditions, from the editorial offices, in which the contents of each issue receive their first inception, to the delivery of bound copies of the journal to lorries waiting in a private roadway.

And so we look forward to further expansion, improvement following improvement, of the journals with which we in Temple Press have the privilege of serving both public and industry.

INDUSTRIAL SUICIDE

In answer to our Editorial on the uneconomic price-cutting conditions that exist in our industry, we have received several important replies.

We publish that of the British Xylonite Co., Ltd., first because it has been the longest established of all in the plastics industry, and because we consider the letter the most carefully considered reply we have received.

British Xylonite Co., Ltd.

The Editor, *Plastics*.

Hale End, London, E.4.

Sir,—The very interesting Editorial in your August issue merits the serious consideration of all sections of the Plastics Industry, although I gather you are referring more particularly to the moulders.

Most of us are apt to think that a competitor is price-cutting if he underquotes us, but he may be justified in doing so. It is not true, however, that a reduction in price invariably means a reduction of quality, and that is why a definition of price-cutting is needed in this discussion. It is obvious that firms which make an efficient study of the methods of production may be able to quote lower prices than others, but they should not be accused of price-cutting if they pass on to their customers the benefit of their experience and efficiency.

I presume it will not be disputed that a normal price should cover the following items:—

(1) Raw materials.
(2) Direct labour.
(3) Overheads.
(4) Profit.

The degree of accuracy in estimating costs will depend upon the costing technique of the firm and a price which does not include a reasonable profit may be called a cut price. Under competitive conditions some manufacturers do not cover the whole cost, and if the prime costs of raw materials and direct labour are not covered then great harm is done to the industry and no one benefits. Firms which practise such ruthless price-cutting have either given up the idea of recovering their overheads or else they are ignorant of the very elements of costing. Instead of price-cutting, manufacturers may seek to reduce their costs by

(1) Using cheaper materials.
(2) Improving production methods.
(3) Reducing overheads.

In this case there may be damage to the industry unless quality standards are maintained. The two major problems are therefore the development of proper costing methods and the maintenance of quality standards.

Price-cutting is probably most prevalent in the moulders' section, and I should add that our subsidiary, Halex, Ltd., decided some time ago as a matter of policy not to quote for every moulding inquiry which they receive. Owing to their particular form of organization it is more profitable to design and market their own products than to attempt to compete for orders with other firms who apparently are not in business in order to make a profit.

I think that all sections of the industry have some responsibility in this matter—makers of plant, makers of plastic materials, makers of plastic articles. The evil can be remedied by voluntary co-operation, and a beginning has been made by some groups of manufacturers of plastic materials. Co-operation is much more difficult for manufacturers of articles, who are far more numerous, vary much more in size, cater for many different trades, and make thousands of different articles.

I agree with you, sir, that price-cutting should be dealt with by a trade association and I think that the British Plastics Federation might organize an energetic campaign to make its members "cost-conscious," with benefits to everyone.

Yours faithfully,
The British Xylonite Co., Ltd.
C. F. MERRIAM, Chairman.

Erinoid, Ltd.

Mr. Sadler, of Erinoid, Ltd., is very forceful in his reply. He and his associates at Stroud we have known for more than 15 years, and can vouch for the extremely high-class materials turned out by the company in that time. In consequence the news of production of cellulose acetate and cast resin a year or two ago was received by us with complete confidence.

The Editor, *Plastics*.

Stroud, Glos.

Sir,—We have read with much interest the leading article in your August number, and we should like to say how thoroughly we agree with the views expressed. Unfortunately the whole tendency of the plastics trade in the last few years has been to reduce the quality of line after line to the common level of junk, with the inevitable result that section after section which used to be good customers of the trade have turned over to some other material in which a higher standard could be maintained.

This apparent lunacy is no doubt due in great part to the over-production in all directions, which, without drastic action, must sooner or later bring disaster to industry all over the world, and the effects are no doubt greater in the plastics trade because that trade is made up, to such a considerable extent, of a number of small businesses which must have orders at almost any price if they are to keep going. The fact that buying is concentrated into a limited number of powerful, and sometimes not very scrupulous, hands means that pressure is exercised against which a small man cannot stand, and the result is that a good line blossoms, rots and dies; a few producers disappear, and the Great of Earth look somewhere else for a 10s. line which they can grind down to 3s. before passing on their way once more.

It seems to us that the remedy on one side is to make an effort to improve the public taste, but that seems to be hopeless when journalism seems to be almost exclusively directed to the opposite end. There remains only the possibility of a combination of actual manufacturers, whether of raw material or finished articles, to endeavour to maintain a reasonable standard of quality and a reasonable margin of profit. We are glad to say that a start has been made in this direction with an Association of Artificial Horn Raw Material manufacturers, in connection with the button trade, and also in connection with the knitting pin industry, and we

hope it may be possible to extend those arrangements in the course of time to cover the whole trade using casein material.

Yours faithfully,
A. SADLER, General Manager.
For Erinoid, Ltd.

Thos. De La Rue and Co., Ltd.

The Editor, *Plastics*.

London, E.4.

Sir,—Your letter of the 12th instant has been awaiting my return from holiday.

I have read your article "Industrial Hari-Kari" and there it no doubt that the price cutting which is at present taking place in the Moulding Industry is seriously undermining the constitution of the industry as a whole.

As I see it, the main source of the trouble lies in the fact that it is so easy and cheap for anybody to make a start in our industry, due to the very excellent services that are available from the vendors of moulding powders.

Small organizations, in view of their very low overhead charges, are able to quote prices which houses of stability cannot possibly meet. The purchaser is then strongly tempted to use these low prices as a basis for negotiating the final purchasing price of his commodity. The result is obviously chaotic and an entirely artificial situation has been produced.

The British Plastics Federation have had this matter seriously in mind for many months past, and its function is to serve its members, both large and small, with a policy satisfactory to all. This, I think you will admit, is not a simple proposition, and in devising a Hall Mark scheme an endeavour to control the ability of licensees of the Hall Mark to produce a moulding to a prearranged standard is, we think, a very important step in the right direction.

As a leading firm in the industry, we definitely feel that the interests of our customers can be served only by having up-to-date plant and efficient personnel to give care and attention to the closest specification of the products which we are called upon to manufacture.

It is for this reason that we agree with your article "Industrial Hari-Kari" as being a faithful indication of the condition which exists.

Yours faithfully,
Thomas De La Rue and Co., Ltd.
H. C. PARKER, Director.

In the above we have a letter that hits at the root troubles. As for the Hall Mark, it will be of great value, and we know that the British Plastics Federation have not merely visualized it as a panacea for all industrial ills. If it is accompanied by other strong action we shall be more than pleased with the Federation's work. Alone, it will suffer as other Hall Marks have done in the past.

British Artid Plastics, Ltd.

Mr. Barclay Inglis's company, which began only a few years ago, prompted us, in view of the fact that it brought a new artistic type of manufactured plastic into the market, to hail this process as of great importance in raising the status of the entire industry.

The Editor, *Plastics*.

Slough.

Sir,—I have read your Editorial entitled "Industrial Hari-Kari," with which I find myself in cordial agreement.

As you are, I think, already aware, we have from the first set our faces against price-cutting, in the sense of handling work whose quality must suffer because of the cheapness required by the customer. We have refused to accept work at prices below those at which we knew we could turn out a well-made job, since we have all along felt that only by establishing a reputation for sound work can a firm hope to endow itself with goodwill.

The difficulties in the way of restraining the less far-seeing manufacturers from bringing the materials of our industry into disrepute must, at this late date, be enormous. The quality of the article is, after all, the ultimate indication as to whether price-cutting in the sense in which we are now using it has taken place, since what may be a full price to a large moulding concern, may be an impossibly cut price to a smaller concern, assuming an equal standard of quality in each case. For this reason, any attempt at creating price standards, or standard costs, would be impossible.

The Federation's belated attempt to introduce a Hall Mark may assist in the raising of standards amongst members of the Federation, but there will still be left two groups, outside the scheme. I refer to those firms who, like ourselves, are not in entire agreement with other features of the Federation's policy, who, for that reason, are not members of the Federation and, therefore, will not be embraced by the scheme. Secondly, there will undoubtedly continue to exist a number of firms still moulding inferior quality articles, for the reason that certain customers (misinstructed in plastics) will always buy on price alone, regardless of quality, and certain moulders will no doubt continue to mould this type of work, rather than place the interests of the industry as a whole before their own interests in refusing it.

To my mind, this last category of buyers and manufacturers provides the reason why I do not think that the evil of under-cured, under-weight, and sub-quality mouldings will ever be completely eradicated. Meantime, those firms who will not handle inferior quality work must watch orders being placed elsewhere; although that need not occasion them much concern, as work of that type may, for the time being show profits, but will in the long run serve only to bring the firm into disrepute.

Whatever may be one's views on Totalitarian States in general, one can but feel that a problem of this kind could be dealt with only under a Dictatorship!

With kind regards,

Yours sincerely,
A. BARCLAY INGLIS, Managing Director,
For BRITISH ARTID PLASTICS, LTD.

In the short space available it is not possible to reproduce further letters, but we can, at least, say that we have received forceful and constructive letters from many other prominent men in the industry. Mr. H. V. Verrells, of E. K. Cole, Ltd., writes: "I am fully in agreement with all your views expressed in 'Industrial Hari-Kari.'" Mr. J. B. Finlay, Managing Director of Ashdowns, Ltd., states that his company is in entire sympathy with the views expressed in our leading article, and reminds us that they had already, a month or two ago, taken steps to protect themselves from the ill-effects of the conditions now prevailing in the industry.

RADIOLYMPIA, 1939

AS predicted in our August issue, fewer moulded cabinets were shown at the recent Radio Exhibition, Olympia, than in previous years owing to the outstanding popularity of wood veneers, some of which are both unusual and striking in colour and configuration, especially those used in the construction of new Murphy sets. One noticeable feature of the Exhibition was the growing use of moulded parts, such as escutcheons, knobs, panels and special fittings for portable battery sets, which are, incidentally, now in great demand for A.R.P. The most outstanding 1940 battery receivers were those displayed on the stands of E. K. Cole, Ltd., H.M.V., McMichael, Ultra and Cossor, all of whom are making clever use of various coloured mouldings, particularly escutcheons with a sturdily designed moulded handle fitting flush into recesses on the top of the receiver. In the model radio factory, one of the most popular features of the 1939 Exhibition, the important part played by plastics in interior assembly was clearly demonstrated. Examination of assemblies by well-known manufacturers showed that the majority are making full use of plastic parts and that the high electrical properties of both laminated materials and mouldings are now being well appreciated.

In conversations with manufacturers at Olympia we learned that the public reaction towards moulded parts in contrasting colours to that of the set itself is distinctly favourable. Whilst it is very unlikely that completely moulded receivers will, in their present form, oust wooden ones from the market, it is regarded as almost certain that more extensive and probably more

(Continued on page 275.)

1. Press button panel moulded of phenolic resin for Bush Model P.B. 65. 14½ guineas.

2. Ivory moulded escutcheon and knobs for Cossor portable Model M. 44. Price £7 15s.

3. Marconiphone moving coil loudspeaker with moulded fret and knob. £2 10s.

4. McMichael portable battery set with moulded fittings. which hold in position the Rotobar tuning system which dispenses with usual knob. 7 guineas.

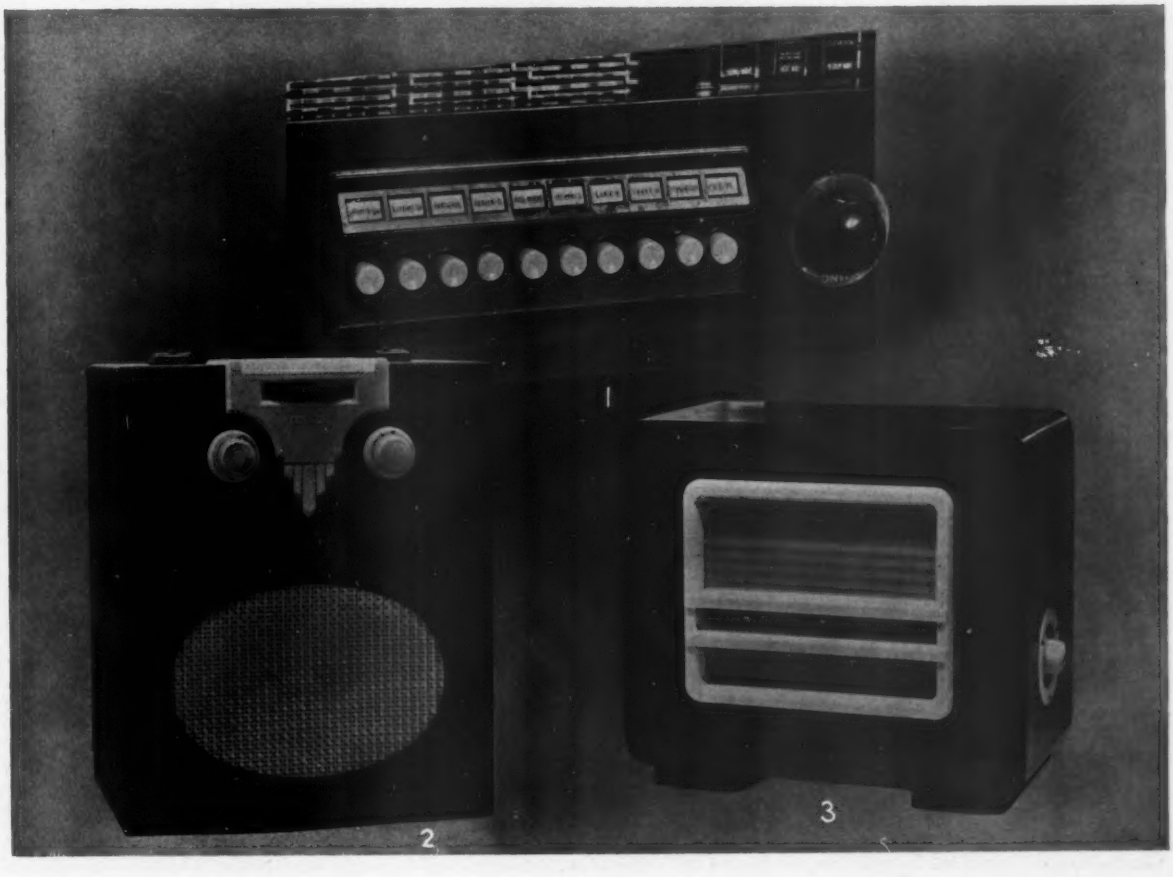
5. Ekco portable, Model P 150, with moulded handle, panel and fret. 8 guineas.

6. Ultra Model P 60 is equipped with ivory moulded panel. Set priced at 8½ guineas.

7. Moulded Diakon G.P.O. telephone on stand of H.M.V.

8. Escutcheon and keys on Pilot Model T. 63. Phenolic resin and urea. Set at 12½ guineas.

9. H.M.V. Model 1402 with ivory moulded fittings. 8 guineas.



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original use will be made of coloured mouldings in the future. The use of an ivory-coloured moulded escutcheon for the H.M.V. eight-guinea battery receiver is an excellent example of the contribution which can be made by plastics to the appearance and utility of the modern set. In this particular instance the moulding renders the receiver very distinctive-looking and right out of the eight-guinea class.

Almost every stand at the Exhibition showed two or more television sets, but the contributions made by plastics were mainly reserved to tuning knobs and frames for the screen. In the interior assembly, however, fairly extensive use was made of plastics, and this is obviously an outlet of considerable potential importance, as in normal times the demand for television sets is likely to be very considerable.

Summing up, our impression of the 1940 sets is that they show a tendency on the part of manufacturers to compromise and experiment. They have been forced by change of fashion and extension of range to give preference to wood as a material of construction for sets, but it is realized that wood and plastics are not completely divorced; indeed, coloured moulded parts can give a very desirable air of distinction to what might otherwise be a rather mediocre receiver. True the future does not seem very bright for large mouldings, but we are confident that as long as plastics can improve the appearance of the modern set they will certainly be retained. There seems little doubt that injection mouldings, now widely used in the American radio industry, will soon be extensively used over here as they are obtainable in the most catholic range of colours and in a wide variety of ornamental shapes. Acetate can also be moulded over die-casting.

THE PRICE OF SYNTHETIC RUBBER

A READER who seems rather of the opinion that synthetic rubber is too costly, asks us when it will come down to the price of natural rubber. As the price of the latter is about 8d. or 9d., it seems unlikely that this ever will be so, and the best answer to him is, probably: "If you want a better material than natural rubber you must be prepared to pay for it." Actually, the synthetic variety is not better in all respects, but for special purposes there are definite advantages.

Some years ago the price of the German synthetic material was about 3s. a lb. To-day it is given as 1s. 9d. to 2s.—a very big diminution, and it will probably go lower. How much lower we are not prepared to say, especially as, candidly, we cannot tell whether or not this price is supported by subsidy. Furthermore, to give the price at all is scarcely advisable since very little has ever reached this country.

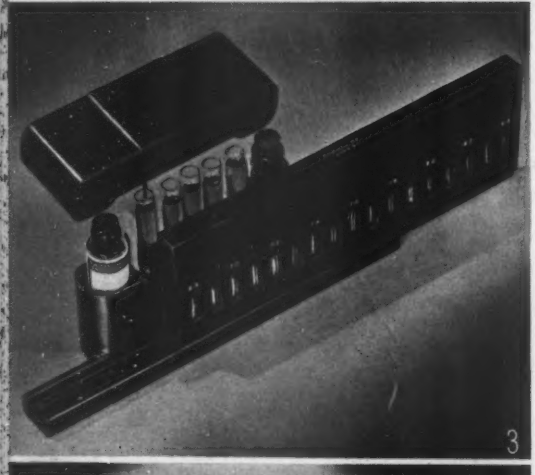
Increase in output usually brings a diminution in cost, but the process, and we refer to that of production of Buna from acetylene which is an excellent example, is so complicated that certain basic costs will not decrease. The works plant is extremely costly, maintenance is much higher than in ordinary works, there is need for special precautions owing to highly inflammable materials, and the testing of raw materials, finished products and research are expensive, but very necessary, adjuncts. But the main reason for high cost is the fact that there are so many intermediate processes before the acetylene becomes synthetic rubber. Thus we have first to make carbide by heating a mixture of lime and coke in an electric furnace heated by electricity at 10,000 volts. This needs quite a sizable electricity station in itself when you probably have to produce 100 or 200 tons of carbide a day. The carbide is then treated with water to produce acetylene. Quite an easy job, seemingly, and it has been produced for many years, but precautions have, obviously, to be taken. Then the acetylene is transformed by catalysis into the chemical acetaldehyde, a costly process which, unfortunately, gives only about 70 per cent. of the theoretical yield. About 2 tons of the original carbide gives only one ton of acetaldehyde. A third process is necessary to convert the acetaldehyde by hydrogenation into another chemical, named butylene glycol, giving little more than 50 per cent. of the theoretical yield, and yet another to transform this to butadiene. The latter is a gas and is polymerized directly to synthetic rubber. Since the raw material is a highly reactive and inflammable gas, and the polymerizing agent, metallic sodium, not one very pleasant to work with, the difficulties involved are not negligible.

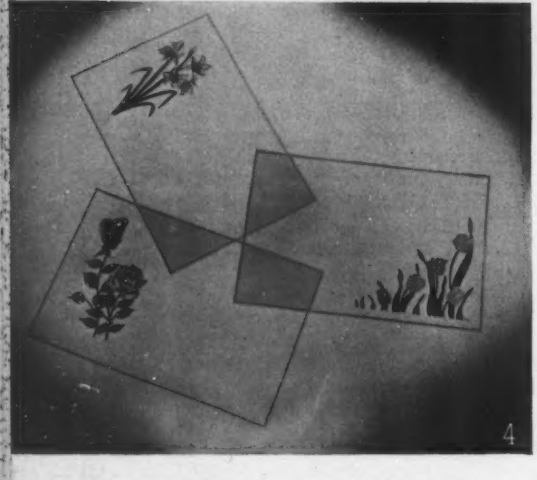
Added to which we must remember that to make 1 ton of finished rubber we probably need, roughly, 4 tons of acetylene, and to make this amount of acetylene we need at least 10 tons of carbide. Since Germany is supposed to make 10,000 tons of rubber a year, the reader can work out the size and cost of plant needed to make 100,000 tons of carbide a year and that of the plant for the succeeding stages. Theoretically, the job is one of the most fascinating the chemist has ever done. Practically, it is an immense work and Germany is entitled (as are the U.S.A., Russia and Great Britain also) to our admiration.

It is interesting to note that, should the cult of national self-sufficiency in "rubber" die in Germany or Russia, the production would decrease enormously and the price would increase. The use of synthetic rubber, even in Germany and Russia, would probably be restricted, as it is in Great Britain and America, to its proper and special uses based on its inherent advantage over the natural material.

Water Pollution Research Board

A Report of the work carried out by this board has just been issued. It contains reference to the research sponsored by the Director of the Chemical Research Laboratory on the base-exchange properties of synthetic resins prepared from phenolic substances and tannins, also of certain aromatic bases with acid-exchange properties. For example, resins from sulphited quebracho tannin have high base-exchange properties and resins from m-phenylenediamine have acid exchange properties. These resins, when freshly prepared, contain some organic matter which is soluble in water. The soluble matter can, however, be removed from some of the resins by extraction several times with hot water.





INTERNATIONAL

1

HUNGARY is not usually considered an industrial country, but we have on several occasions shown examples of moulding work carried out there. This picture shows two cigarette lighters embodying the use of both synthetic resins and metal. The moulding powder used was Futurit, and the company responsible for the work Kábelgyár, Ltd., Budapest.

2

AN attractive and very serviceable injection moulding of cellulose acetate, made by Thermo-Plastics Incorp., Port Clinton, Ohio, U.S.A. It is the temperature control gauge used on the well-known Norge American refrigerator. The numerals and letters are in relief and coloured red and blue.

3

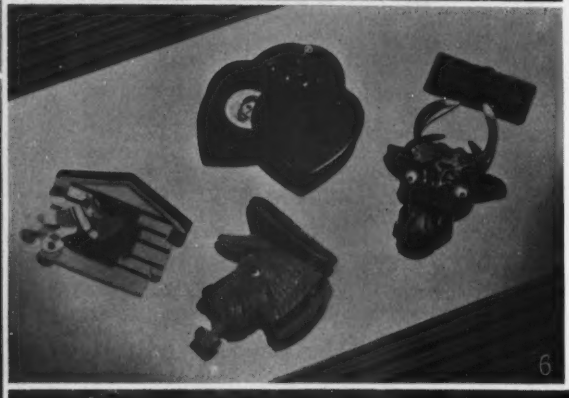
FOR the determination of pH this very serviceable comparator is now being extensively used in America. It is moulded of Durez by Colt's Patent Fire Arms Mfg. Co., and represents a very fine piece of work. Durez is made by General Plastics Incorp.

4

THESE transparent Lumarith table mats bring spring to the luncheon table with the freshness of their painted flower patterns. Available in three designs — roses, lilies and tulips —at only $1.00 each. Printed from hand-painted patterns on 12-in. by 18-in. Lumarith. Distributed by Ellison and Spring, Inc., 245, Fifth Avenue, N.Y.C., U.S.A.

5

"BABY PANDA" is the attractive new motif of this original four-piece Bex mealtime set made by Halex, Ltd., in ivory, white, pink, blue, green or lemon. The set consists of a mug, feeding bowl, tea plate and spoon, and all articles, except the spoon, are decorated with "Baby Panda" figure.



6

NEW Lumarith jewellery from Cohn and Rosenberger, New York, U.S.A. These brooches are commonly known as "tricky brooches," and have cunningly hidden receptacles for tiny miniature photographs. Lumarith

is a product of the Celluloid Corporation, U.S.A.

7

TRANSPARENT Textolite is the material used by the General Electric Co., U.S.A., for this very attractively designed and eminently practical fly case. We imagine that exponents of the piscatorial art will certainly welcome this new case.

8

PLIOFILM, the transparent sheet material composed of rubber hydrochloride and made by the Goodyear Tyre and Rubber Co. (Great Britain), Ltd., finds many interesting uses in the theatre. The photograph shows the curtain of the new show, "1,000 Years of Peace," at the Alhambra Theatre, Bucharest, Rumania. The upper roses and lateral columns are of Pliofilm Silver metal 170.

9

A VERY attractive candle-lamp, moulded of Futurit moulding powder by Kábelgyár, Ltd., Budapest, Hungary, and typical of the excellent work now being turned out by that concern.

10

THIS is the new Gillette Dry Shaver, manufactured by the Gillette Safety Razor Co., Boston, U.S.A. The housing, in two parts, is moulded of Textolite by the Plastics Department, General Electric Co., for Gillette.

11

THE tray shown in the accompanying illustration is designed by Kathryn M. Conley, of Saratoga Springs, N.Y., and moulded of black Bakelite by the Auburn Button Works, Auburn, N.Y., U.S.A. It is used in beauty salons as a support for the head while giving permanent waves and hair dyes.

12

THE Beauty Lite make-up mirror, the back view of which is shown in this photograph, is enclosed in a Tenite case, injection moulded in three parts by Thermo-Plastics Incorp., Port Clinton, Ohio, U.S.A.

13

THE "Blenheim" pattern fitted case made by Halex, Ltd., a subsidiary of British Xylonite Co., Ltd., is a new line and likely to be very popular. Various colours are available, including tortoise-shell, with maize or green enamel design inlay.

14

KNOWN as the "Hollywood" tooth brushes, these are the latest productions of Halex, Ltd., a subsidiary of British Xylonite Co., Ltd., Hale End, London, E.4. The Xylonite handle is half crystal and half assorted colours.

All the usual machining operations can be performed on Bakelite laminated. This illustration shows a selection of the many types of gear which are now in service cut from the material, and the applications range from drives transmitting heavy loads to delicate gears used in scientific instruments.

Gears from Bakelite Laminated Material

A section of a 50 h.p. drive to a set of rolls. The gear in the foreground is cut from Bakelite laminated and has been working 12 hours a day for 10 years. Its condition, as may be noted, is still sound.

A description of the industrial uses and advantages of the different types of gears fabricated from laminated material manufactured by Bakelite, Ltd.

THE development of modern laminated plastics has provided the engineer with new materials having properties not possessed by iron or steel. The application of these synthetic resinous materials to gear manufacture provides an interesting example of their ability to withstand difficult conditions of service. Gears cut from Bakelite laminated, a phenolic material manufactured by Bakelite, Ltd., have, as shown in the table of properties given in Table 1, an impact strength greater than cast iron and are one-sixth of the weight of cast iron or steel.

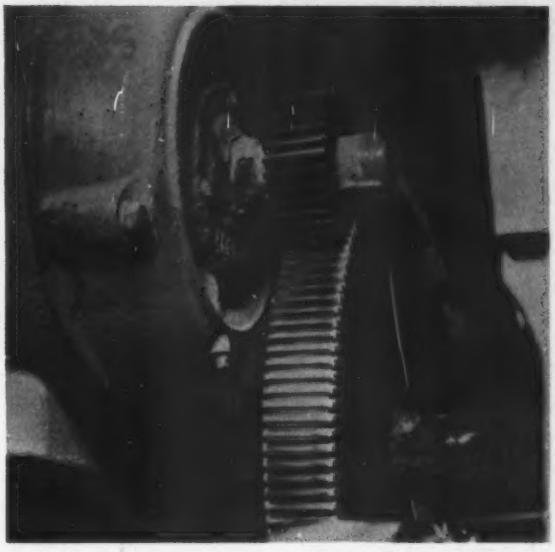
TABLE 1.

Comparative Properties of Bakelite Fabric Laminated Material and Cast Iron.

	Bakelite Laminated.	Cast Iron.
Impact strength edgewise (ft. lb.)	1.5-2.5	1.1
Impact strength flatwise (ft. lb.)	2.5-4.0	1.1
Tensile strength (lb./sq. in.)	9,000-14,000	18,000-27,000
Cross-breaking strength (lb./sq. in.)	17,000-26,000	27,000-55,000
Specific gravity	1.32-1.38	6.9-7.5

Advantages offered by laminated gears are primarily: a remarkable resistance to corrosion; water resistance; resistance to acids and mild alkalies; resilience and ability to absorb shock; silence in operation and long life. There are various grades of Bakelite laminated, some with fine fabric filling, others with coarse, while for some classes of gears a grade may be employed having a paper base. Each of the properties enumerated may be developed to a greater or lesser extent depending upon the grade adopted. When these properties are considered in relation to practical industrial requirements, the wide potentialities of these gears are more readily appreciated.

Corrosion resistance invites their use in chemical plant. Exposure to acid fumes and other corrosive influences will rapidly destroy metal while leaving the Bakelite material unaffected. Moisture will cause steel gears to rust badly, particularly when they are situated in inaccessible positions where maintenance is difficult. Laundry machinery provides a typical example of an application of this type. The steam, water and general humidity provide difficult conditions for metal. Similarly, in the paper-making industry most of the processes necessitate a continual flow of water, and gears from Bakelite material have been adopted with success on plant employed in paper-making factories. Such gears are also employed in the cutting machinery used at the coal face in mines where the conditions again are damp and where metal-to-metal contact should be avoided owing to the possibility of sparking or electrolytic action.



Laminated gears will frequently give satisfactory service under difficult conditions. Bakelite material is used for this application on a colour-grinding machine where considerable dust is encountered.

Showing a dynamometer employed in the laboratories of Bakelite, Ltd., to test specimen gears to destruction.

The question of silence in operation is of greater value than may at first be realized. The diminution of noise in factories is now regarded as an important factor in the promotion of health and efficiency among employees, while silence is essential in the operation of many mechanisms, such as hospital equipment, cinematograph projectors, gramophone motors, etc.

The high-pitched metallic ring and general noise level frequently associated with metal gear drives, particularly high-speed drives, can be substantially reduced by the introduction of one or more of these non-metallic gears into the train. Some interesting figures were recently obtained in the laboratories of Bakelite, Ltd., giving the relative noise emission of gears machined from metal and Bakelite material. For the purpose of test, the laminated gear was attached to the shaft of a Heenan and Froude dynamometer and was driven by a hardened steel gear at 1,440 r.p.m. By this arrangement the load on the gear could be conveniently varied over a wide range from about ½ h.p. to 20 h.p.

This procedure was repeated with a machine-cut steel gear in place of the laminated type, and the noise emitted was measured on a Marconi-Ekco noise meter, the instrument being maintained at a fixed distance from the machine. The test results on graph show that, at the rated horse-power of the laminated gear (2.15 h.p.), the relative noise emissions (in phons) are 8 and 21—a difference of 13 phons.

Having now a general outline of the properties of

Bakelite gear material, consideration may usefully be given to its structure as well as its technical advantages and limitations. Although it is unusually tough for an organic material, its structure must be borne in mind when machining. The material is normally built up from many laminations of special fabric impregnated with Bakelite resin and formed into a solid board under heat and pressure. When machining at right angles to the direction of the laminations, arrangements must be made for the material to be rigidly backed up to prevent the last two or three laminations from fraying as the tool ends its cut.

Apart from this precaution the material is machinable in exactly the same manner as metal, the speeds and feeds being approximately the same as for brass. Bakelite gear material can be turned, drilled, tapped, sawn, punched and, indeed, any normal machining operation can be performed without difficulty.

It is possible for the user to machine his own gears from blanks supplied by Bakelite, Ltd., while there are many specialist commercial firms experienced in this type of work. The teeth may be cut by any of the various methods, namely, automatic single tool gear cutter, gear shaper, hobbing machine, or standard milling machine with index head. For ordinary milling machine practice the cutter can operate at a maximum of 400 ft. per min., the speed depending on the finish required. Steel gear tooth milling cutters may be used or, if necessary, a fly cutter. Standard hobs will give excellent results when the machine is operating at a maximum of 300 ft. per min. and gear shapers equipped with high-speed attachments may be operated at 600 strokes per min.

Wherever possible gears should be cut in multiple with the last blank backed up with a rigid material to prevent the edges from fraying.

The size of gears machined from this material ranges from the miniature pinions in instruments to large gears transmitting really heavy loads. The material is available in various thicknesses from .004 in. to 4.0 ins. and the blanks are produced up to 42 ins. by 42 ins.

Design Features

Design largely governs the maximum load carrying capacity of laminated gears. Bakelite material has been successfully employed for gears transmitting 300 h.p., and subject to the design and conditions of service being satisfactory, there is no reason why the loading should not be increased to 500 h.p. In general, the laminated gear is comparable in power capacity with cast iron, but has advantages in its sphere of activity when compared with metals. Owing to its low weight (S.G. 1.34), high peripheral velocities can be used. For ordinary practice, 3,000 ft. per minute is considered a maximum, but where good bearings with rigid mountings can be fitted, velocities up to 7,500 ft. per minute may be considered. The natural resilience possessed by these materials enables them to withstand shock loads and absorb any effects due to inaccuracies in commercial gear cutting. As a result of recent life tests, it was found that standard fabric materials would transmit a load equivalent to eight times the normal capacity for a period of 5 hours, while material made with fine fabric withstood a similar load for 10 hours.

Most gearing is subject to overload from one cause or another and, to allow for this unknown factor, gears should be made capable of transmitting at least 25 per cent. more than the rated horse-power. If the drive is subjected to a known overload, the gears should be made strong enough for the full overload, plus 25 per cent. for safety. Gears for machines which are subject to considerable shock, such as reciprocating pumps, rolls and crushers, are often made capable of carrying 250 per cent. of the normal rated load.

When the pitch line velocity exceeds 750 ft. per min., it is not practicable to use a pinion with less than 18 teeth. It is possible to make spur gears with as few as three teeth, but, for high-speed or hard work, it is not satisfactory to have small numbers of teeth. When gears with less than 18 teeth are necessary, special consideration to the design of tooth form should be given.

Another point that should be borne in mind when designing laminated gears is that greater efficiency is generally obtained from finer pitches. Without requiring too wide a face to transmit the power, the finest possible pitch should be chosen. Further, it is always desirable that gears from Bakelite material should mesh with steel or C.I. gears and both wheel and pinion should have machine-cut teeth. Care should be taken to avoid mating laminated pinions with wheels having cast, machine-moulded or badly worn teeth.

While the meshing of two laminated pinions is not recommended, there may be special occasions where non-corrosive or acid-resisting materials are required throughout. These applications warrant special consideration and it is desirable to consult the manufacturers on this point. In addition to extensive research facilities, a special technical service is maintained by Bakelite, Ltd., to deal with all users' problems.

Economic Aspect

The potential user is naturally interested in the relative costs of metal and laminated gears. The initial cost of Bakelite material per pound is higher than metal per pound, but since the former is one-sixth of the weight of cast iron or steel, the cost of a laminated gear blank for a given job is fully comparable with its metal equivalent. The subsequent machining costs would be the same in each case. The cost of the laminated material is also largely dependent upon the quantity ordered because production costs can be appreciably decreased on large quantities.

The life of the laminated gears is long under reasonable conditions and although ill-treatment is naturally to be deprecated, instances may be cited where lengthy service has been obtained when the conditions have suggested a life of only a few months. An example of this longevity was recently afforded by an application in which a gear cut from Bakelite material was installed on the 50 h.p. drive to a set of rolls. The conditions of service were such that metal gears in this position lasted three/six months, while the laminated gear installed 10 years ago is still giving satisfactory service. Other instances of a similar nature have been reported where trouble experienced with metal gears has not been evident when using laminated gears.

Conclusion

From what has been said, it will be realized that laminated gears have much to offer the engineer. Their resistance to corrosion, water and chemicals recommends them for applications in various branches of industry. The high speeds which their light weight makes possible, coupled with their silent operation, suggests an extension of their use for reduction gearing on electric motors. Many potential applications could be outlined but the value of the material for new uses can probably be better assessed by the engineer and user having a fuller knowledge of their own particular requirements.

A New Cast Resin—for the construction of machinery and apparatus

Some notes on Raschig's new Dekorit F and the plant made from it for chemical and mechanical purposes

ALTHOUGH the unfilled ("straight") resins are particularly suited to shaping operations with cutting tools such as are applied to metals and wood, they have so far found few technical applications except for fancy goods and ornaments. The reason is that the products of this type hitherto available have been liable to shrink, warp and crack as further condensation of the resin proceeded, slowly but continuously. Also, they contained soluble electrolytes which reduced their insulation strength and resistance to water, whilst the colourless transparent varieties were not sufficiently fast to light.

The field has therefore been largely held by the filled resins in the form of mouldings, and many valuable properties in these have been developed by suitable combinations of resin and filler. Certain disadvantages, however, have still to be overcome. Thus an increase in impact strength may entail reduced resistance to water, oils and greases, whilst post-moulding shrinkage and irregular hardening may occur. Where these drawbacks can be accepted, moulding is the rational procedure for mass production. When, however, complicated shapes have to be made in small numbers, an easily machined material, available in the sections familiar to the skilled worker in metals, etc., will be the obvious choice.

Properties of the New Cast Resin.

A new resin which fulfils the above requirements is now being manufactured by the Chemische Fabrik Dr. F. Raschig G.m.b.H., Ludwigshafen, under the designation "Dekorit F." Dekorit F is a practically fully hardened phenol resin with which the undesirable consequences of after-condensation have been eliminated. It shows practically no changes in dimensions, and is very hard and heat-resistant, unaffected by temperature variations and stable up to 130 degrees F. It is extraordinarily homogeneous and free from porosity, and will take a high polish. It is resistant to all acids except strong nitric acid, solvents, liquid fuels, vegetable and mineral oils, gases, ammonia, organic bases and weak alkalis. It is odourless, and being non-inflammable is safe in use. In all these connections it is superior to all known phenol resins, cast or moulded with fillers. Like them, its heat conductivity is moderate, and its resistance to impact is not high. It is, however, rather less brittle than other phenoplastics unless these are reinforced with fibrous fillers, and its brittleness is not such as to interfere with the commonly employed machining operations. Its natural colour is a steel-grey to black.

Manipulation.

All the usual methods of machining cast resins can be used with Dekorit S. It is supplied in rods from 6 mm. to 300 mm. diameter, in tubes of a range of sizes, in sheets, and in blocks. For repetition work it can be supplied in special shapes to minimize machining and reduce waste. High-speed steel tools are suitable, but the hard alloys (Widia, etc.) are better for working Dekorit F. It is best shaped by turning, using a high cutting speed and a small feed; in planing, the requisite high cutting speed is not easily attained. Milling should be done on high-speed machines. Grinding is applicable, especially for threads, grooves, etc. An almost indestructible polish can be produced with the polishing head.

Recently, a cement has been developed which gives very strong joints with the new resin, and, when hardened, has the same properties as the resin itself. This greatly facilitates the fabrication of complicated fittings, such, for example, as illustrated in Fig. 1.

Uses.

The range of possible uses for Dekorit F in the chemical industry is obviously very wide, particularly as regards substitutes for special alloys and ebonite.

In the construction of pumps for acid, it is of interest that the coefficient of friction of Dekorit F is the lowest yet attained with any synthetic-resin bearing-material. Thus at a bearing pressure of 50 kg./sq. cm. and a

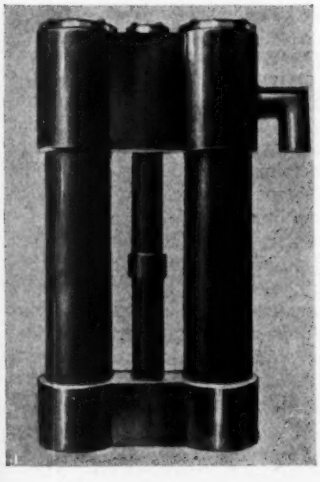


Fig. 1.—Density meter for corrosive liquids, constructed of Dekorit F.

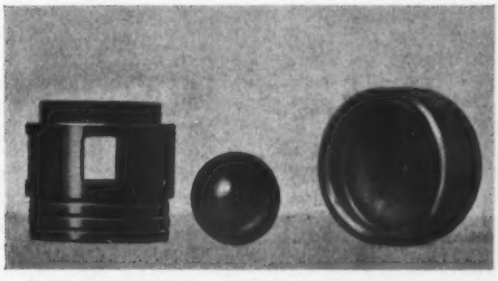


Fig. 2.—The same material, used as ball valve, has stood up to long service in acid medium.

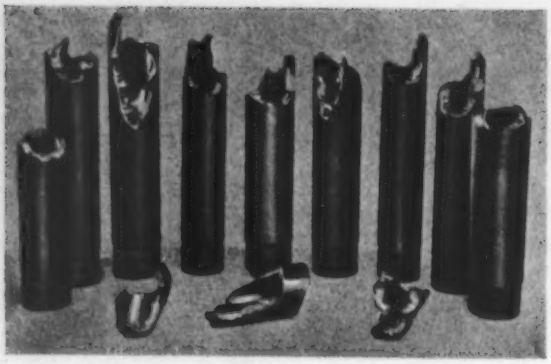


Fig. 3.—Dekorit tubes collapse only under very high pressure.

speed of 1 metre per second, the coefficient of friction amounts to 0.03 as against 0.06 for a moulded gland (cf. Heidebroek, *Kunststoffe*, 1938, 28, 200).

The piece of apparatus shown in Fig. 1 and referred to above is a continuous density-meter for corrosive liquids. In a plant handling hot chlorobenzene and hydrochloric acid, fittings of Dekorit F have withstood months of use without wear. A ball valve in an acid pump (Fig. 2) has given satisfactory service for several months, showing only slight mechanical wear, whilst the special bronze ball it replaced lasted only ten days under the same conditions. A piston of Dekorit F gave similarly good results.

Dekorit F replaces ebonite satisfactorily for rolls, patterns, utensils, etc.; outlet connections and plugs for plug cocks represent further uses. The manufacture of artificial fibres provides many examples where Dekorit F fulfils the stringent requirements there met with as regards strength combined with chemical resistance. Tubes of Dekorit F can be used without hesitation for moderate pressure. Fig. 3 shows a number of such tubes after collapsing only under an internal pressure of 150 atmospheres. It goes without saying that there are manifold uses for Dekorit F in the laboratory and in the improvisation of small-scale experimental plant.

TABLE 1.

Physical Properties of Dekorit F.

Colour	Steel-grey to black.
Specific gravity, 20° C.	1.25.
Ball-hardness (VDE)	About 1,300 kg./sq. cm.
Bending strength (VDE)	About 1,400 kg./sq. cm.
Impact bending strength (VDE)	About 23 cm.kg./sq. cm.
Notched bar impact test (Nitsche and Zebrowski)	About 1.8 cm.kg./sq. cm.
Tensile strength at 20° C.	About 980 kg./sq. cm.
Compression strength	About 1,550 kg./sq. cm.
Thermal stability (Martens—VDE)	About 130.
Fire risk	Non-inflammable. Almost non-carbonizing.
Resistance to ignition (Figure of merit)	3.
Coefficient of linear expansion 20-50° C.	10.4×10^{-6}
Surface resistance (comparative figure)	4 (1 million to 10,000 megohms)
Surface resistance (after 24 hours in water)	4
Dielectric constant at 25° C. (VDE)	19
Dielectric loss factor at 25° C. (VDE)	0.31
Breakdown voltage at 19° C.	8.5 kV/mm.
Internal resistance (VDE)	About 140,000 megohms.

TABLE 2.

Chemical properties of Dekorit F. Percentage change in weight of a test-piece 50 × 15 × 0.8 mm. (25 sq. cm. surface).

Steam, 4 weeks at 100° C.	−0.95, surface unaffected
Conc. HCl, 4 weeks at 50° C.	−0.50, surface unaffected
Conc. H_3PO_4, 4 weeks at 50° C.	−0.72, surface unaffected
Conc. HF, 4 weeks at 50° C.	−0.51, surface unaffected
80% H_2SO_4, 4 weeks at 50° C.	−0.50, surface unaffected
Conc. H.COOH, 4 weeks at 50° C.	+0.17, surface unaffected
Oleic acid, 4 weeks at 50° C.	−0.01, surface unaffected
Mineral oil, 4 weeks at 50° C.	−0.01, surface unaffected
Heavy paraffin, 4 weeks at 50° C.	−0.01, surface unaffected
Liquid fuel mixture, 4 weeks at 50° C.	−0.00, surface unaffected
Ammonia, 4 weeks at 50° C.	−0.40, surface unaffected

Dr. Emil Dreher, *Kunststoffe*, 1939, 29, 137.

Vinyl Plastics for Flame-resistant Electric Wire

The development of plasticized polyvinyl chloride as an insulation material for wire and cable was announced by the General Electric laboratory, Schenectady, N.Y., U.S.A., several years ago. Since that time experiments have been constantly carried out and many installations completed with the new insulated wire known as Flamenol. To-day more than 3,000,000 ft. are in service throughout the United States.

Flamenol will not burn and is a great protection against fire. It is high in dielectric strength, yet tough and strong, serves both as an insulation and as a finish. The wire needs no protective braid, lead or armour, and thus saves space. Organically inert, Flamenol resists oil, mild acids and alkalies and moisture, and it has never yet shown signs of ageing.

On November 21, 1937, a new interlocking plant of the Philadelphia Rapid Transit Co. went into operation, and one of the largest signal boxes was wired throughout with Flamenol. It is the first signal installation in the world to be equipped with wire insulated with a synthetic-resin compound, which was chosen principally to reduce the fire hazard. Fire in signal boxes is costly, as it not only destroys material, but disrupts service. Once started in normal rubber-insulated wiring it runs fast and is hard to stop.

In this country the applications of extruded Mipolam tubing, made by Hydro-Plastics, Ltd., is becoming more extensive every month, especially for electrical purposes, as it has been shown that the degree of insulation afforded is extremely high. The degree of flexibility of Mipolam varies from a very soft, rubber-like condition to a rigid, horn-like texture, and the compound can be plasticized to retain its flexibility under extreme conditions of cold. The material is manufactured in a wide range of colours, including that of multi-colours. Owing to its superior electrical properties the compound imparts a maximum of electrical insulation with a minimum wall thickness. The breakdown voltage of the compound is within the range of 30,000 to 40,000 volts per millimetre wall thickness.

In the form of covered wires, a great advantage lies not only in the high electrical properties, but no further insulating material is necessary, as, for instance, cotton, silk and paper, and conductors are easily stripped without having to cut away superfluous materials. For the normal 230 voltage a wall thickness of between .5 mm. and .8 mm. is invariably used. For lower voltages the wall thickness can be reduced to .15 mm. Flexes from 7/46 gauge up to 195/33 and higher, and single wires down to a gauge of 33 are within the range of the extruding press.

OVERHEAD

Most Vital Component of the Cost Sheet

By D. A. DEARLE

WHILE it is generally conceded that the plastics industry has made remarkable progress during the past decade, candid introspection will reveal the fact that many components of this success have lagged considerably. The public have become inured to the new moulded items constantly appearing on the market, but little do they realize the keen competitive situation that has accompanied each innovation. Plastics have undoubtedly reached adolescence so far as diversification of application is concerned, but on the other hand, this vanguard of pioneering activity still lacks that co-ordination so essential to a firm foundation. Research has engaged the time of many chemists, new sales fields have been opened up, and innumerable unique ideas have been promulgated by sales departments, but whether or not the methods of efficient manufacture have advanced in the same proportion remains a moot question. If quotation sheets are in any way the criteria, the answer to this must decidedly be in the negative, for nothing consistent is yet to be found in comparative figures quoted on the average moulded proposition. Most moulding costs are generally considered fairly easy figures to obtain, and estimates, likewise, do not usually require a great deal of time in their preparation. A glance at the variance in prices disseminated by custom moulders, however, will soon disclose the need for a thorough investigation into this phase of the moulding business. It is not implied, of course, that there should be no variation whatsoever in prices quoted, but rather that an approach to uniformity be made. Such progress would clearly indicate the presence of stability in the industry.

Quotations on any moulded part are based on estimates which in turn should have their origin in the results of past experience. Actually, however, every selling price, regardless of the item, embodies three prime elements of cost; namely, material, labour, and overhead. These three simple factors actually determine the price at which the goods are to be sold. It hardly seems possible then that such wide differences could exist in the quotations submitted to purchasers of moulded parts. Perhaps a brief diagnosis of the three cost components might disclose where these divergencies emanate, so with this thought in mind let us anatomize an ordinary cost-estimate.

In the first place there is the material, the cost of which is ascertained either by weighing a sample or converting cubical capacity from a blue print to the number of grams, pounds, or ounces per thousand parts. Moulding compounds vary slightly in their price from one moulder to another, but the difference is usually only a few farthings a pound according to the quantities ordered. Hence, the raw material part of an estimate should not cause any great discrepancy between comparative cost sheets, unless, of course, the finished piece happens to be a very large one.

Having computed the amount of powder, the next step is to determine the moulding and finishing labour. Here, of course, lies an opportunity for different figures. One concern may figure that the part can be moulded with a three-minute cycle, while another might be a little more optimistic, but even so, the total moulding labour should not vary to too large an extent. Of course, if the compound is a thermoplastic there exists the probability that some moulders will quote on the injection method while others will base their figures on compression moulding. Ordinarily, though, the vendee will definitely state the method of procedure desired, so that prices received will be fairly relative. Finishing operations may vary to some extent, but on the basis of highest quality demanded in the finished product there is little room for divergence in this direction.

The final element is that of overhead and it is this component which apparently disrupts any semblance of uniformity in the comparative finished costs. In the application of overhead, figures vary anywhere from 50 per cent. in some plants to 300 per cent. in others and therefore it would be quite unlikely that prices would agree or even approach equality.

The question then arises as to whether or not there is justification for such differences in the comparative burden rates. Other large industries have to apply overhead percentages on their direct labour, yet the selling prices of their products do not vary to such a wide extent and in some instances may be found to coincide. One argument always advanced in defence of price disparity is that a small plant has a much lower overhead than a large one. This, of course, is quite possible, but it must be remembered that the latter company, because of its size, is often able to buy raw materials in large quantities and perhaps can afford to invest in expensive and more economical fabricating machinery. These two advantages tend to compensate for the lower overhead enjoyed by the smaller competitor. One element does not completely offset the other, yet the balance will not be so far out of line in the final analysis. Regardless of this, it is apparent that the various methods used in determining the correct percentage of overhead may be the cause of wide differences in selling prices. Let us, therefore, probe further into this particular phase of the cost sheet.

It should first be pointed out that although overheads are figured on a theoretical basis they are just as actual and certainly as important as the cost of materials or productive labour. It is comparatively easy to obtain the raw material and direct labour costs and it should be no colossal task to ascertain an actual overhead cost. Once the figures have been segregated over a definite period of time the problem of converting them into a percentage on direct labour is not very difficult. If a custom moulder is serious in his intent to obtain an accurate overhead figure and can definitely jettison the tendency to deceive himself subconsciously, he will be able to do so readily with little additional book-keeping effort. Such accomplishment merely involves the proper collation of contributing elements and a thorough knowledge of the indirect labour, material, and depreciation of presses, auxiliary equipment, etc. There are, unfortunately, many pitfalls likely to be encountered in attempting to arrive at a

reasonably accurate overhead percentage, but if these can be recognized and overcome the way will be cleared for the preparation of a much better profit and loss statement. It must be realized that even though an overhead figure has been definitely established it does not remain the same from year to year, month to month, or even from one day to the next. It would be impractical, of course, to change the percentage too often but frequent check-ups must be made in order to estimate correctly on new work.

In the custom moulding business depreciation plays quite an important role on the accounting sheet. Consideration has to be given to the heavy machinery such as moulding presses, preform equipment, injection machines and, if the company makes its moulds, the various lathes, duplicators etc. Where proprietary items are manufactured there is usually quite an investment in dies represented and the rate of depreciation on these is considerably high in most instances. Some concerns include amortization as a separate part of the estimate sheet while others assume the rate to be included in the overhead. The only danger in the latter method lies in the possibility of forgetting to include all the amortizations, or perhaps of spreading the rate over a larger period than is actually the case. The next most neglected burden item is maintenance. Expensive machinery requires adequate upkeep, and moulds undergo a constant strain as a result of the high pressures used in producing the parts. Depreciation or amortization reserve takes care of normal wear, but broken pins, occasional need for shimming cavities, and other such incidentals are constantly arising and provision has to be made for these expenses.

There are, of course, many different methods of computing overhead. Some concerns apportion fixed charges to each machine, others subdivide by the floor area utilized and many distribute the load as a ratio of total productive hours. Regardless of the method used the fact remains that the ratio of indirect labour and material to direct labour will determine the percentage of overhead in the plant. How these are distributed is not nearly so important as making sure that all the expenses are included. No intricate cost system is needed to obtain the amount of moulding and finishing labour over a definite period. Daily work tickets will furnish this information. The amount of material received is just as easy to obtain and hence the actual percentage of rejections can be ascertained by comparing the number of goods produced with the total power used. Very often differences of opinion arise as to the amount of good work that has been produced, and the most direct method of checking this is by means of accurately determining the gross weight of the piece and finally comparing the shipping records with those of the material received and used on the part.

So far as determining the actual amount of direct labour is concerned this is not difficult for it involves nothing more than getting a total of the time cards in both the moulding and finishing departments. These should, of course, include the wages paid for all rejected parts. This method will not necessitate using a hypothetical rejection percentage but will give the actual number of unacceptable parts. Having obtained actual costs of producing and finishing the pieces as well as a true figure for the amount of power used, there remains only the need for correct distribution of the overhead expenses. When all these indirect or non-productive costs have been segregated, the ratio of their total to that of direct labour can very easily be ascertained and it is this percentage that should be used in estimating on future or proposed work. As previously stated, the overhead percentage theoretically changes from day to day but with intermittent check-ups a fairly accurate rate can be established.

To facilitate the work of checking actual costs with those estimated the use of a form sheet is recommended. This consists of two columns, one with the estimated costs and the other the actual as based on a production run. By using this cost-estimate comparison sheet any marked difference will immediately appear and conditions causing it can soon be checked and perhaps rectified. If it is found that the goods are costing considerably more than anticipated and that the selling price is hovering around the prime factory cost, an immediate investigation should be made into the causes. If, on the other hand, there are improvements in the actual costs, the amount of profit will show an increase in proportion. Comparison sheets are not only a great help in following production costs but almost an essential to the efficient operation of a moulding plant.

There are, of course, many other ramifications to the entire system of manufacturing moulded parts at a profit, but closer scrutiny of actual costs and the relationship of indirect to direct labour will go far towards improving plant conditions. If an intimate knowledge of all the contributing elements of cost is once gained it will gradually result in stabilization and bring about a much healthier condition.

Modern Plastics Competition

September 23, 1939, marks the closing of the Fourth Annual Modern Plastics Competition, sponsored by *Modern Plastics Magazine*. Entries already received to date indicate that the current competition will be the largest yet, not only in so far as the actual number of entries is concerned but also in a wider variety of plastic applications, indicative of the broadening interest.

This annual national competition is open, without fee or obligation, to all companies using plastics for their products, to designers, engineers, moulders, laminators, fabricators, raw material suppliers, and machinery and mould manufacturers. Any object or product designed or placed on the market since September 1, 1938, in which any sort of plastic material is a component part, is eligible for entry. Entries in 1938 exceeded 1,000 and more than 6,000 visitors saw the display of prize winners and entries which was held at the offices of *Modern Plastics Magazine*, New York.

There are eleven groups this year instead of five. Additional groups were set up in order to bring equal prominence to moulding, laminating and casting under the Industrial and Decorative divisions. Style, which was omitted last year, was reinstated because of renewed interest and activity in the field. This year's classifications are as follow: (1) Industrial Parts, Moulded; (2) Industrial Parts, Laminated; (3) Industrial Parts, Cast; (4) Decorative Products, Moulded; (5) Decorative Products, Laminated; (6) Decorative Products, Cast; (7) Household; (8) Scientific; (9) Transport; (10) Style; (11) Miscellaneous.

No basic change in the manner of judging has been made this year, but a few changes from the practice of former years will be found in the nature of the awards. Whereas formerly first, second and third awards were made in each division, it has been decided to make three awards of equal standing within every division. The decision was induced by the fact that engineering and appearance design, as well as practicality of the plastic applications, have advanced to a point where such refinements of judgment can no longer be practicable.

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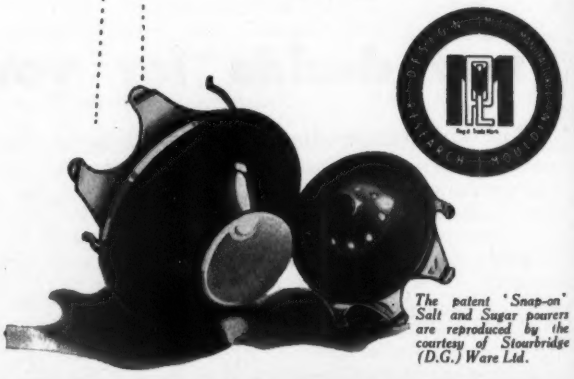

The patent 'Snap-on' Salt and Sugar pourers are reproduced by the courtesy of Stourbridge (D.G.) Ware Ltd.

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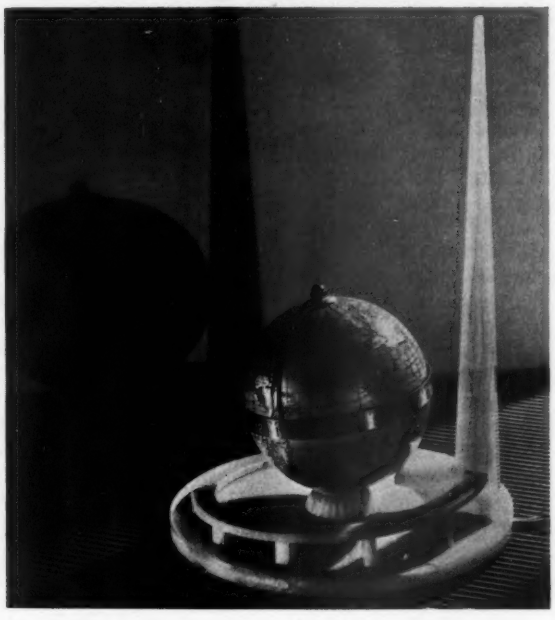
Ideas—

By the EDITOR

If You Want to Know the Time—

Whenever I want to know the time in, say, Honolulu or in Mozambique, as I so frequently do, I have to run down to the Piccadilly Underground and look at the map situated in the ticket hall and graciously provided by the London Transport. This wastes a lot of my valuable time, unless, of course, I have other contemporaneous appointments at the same place.



However, America is once again to the fore to help us and can now provide "The Clock of To-morrow," an attractive desk accessory which simultaneously gives the time in all parts of the world. It represents, in miniature, the now famous exhibit at the New York Fair. The base, ramp and Trylon are fabricated out of Marblette, a cast resin, by Ivorycraft Co. Inc., Long Island City, N.Y.

Bouncing Baby Cars

A correspondent in the *Indiarubber Journal* raises the important problem, "Why not rubber mudguards?" and, indeed, as a means of increasing the sale of rubber the suggestion, if carried out universally, would be nearly as important economically as the manufacture of tyres. Four large mudguards would contain a considerable weight of rubber. The argument is that very few mudguards go through a season unscathed, that if we had flexible mudguards there would be less cause for grumbling than there is at present and repair bills would be considerably reduced. The front mudguards on the larger cars cost as much as £9 to £10 apiece and a hefty collision renders them beyond ordinary repair and necessitates complete replacement. Apparently some commercial vehicles are already fitted with the rubber kind, but since they are not curved and shapely are not used for private vehicles.

Certainly the above cost should open the eyes of plastic manufacturers—rubber and synthetic resin. For the private car rubber presents the always-present difficulty of getting a nice polished surface on it and, moreover, a coloured polished surface. Were a lasting enamel on it possible, by the usual paint-spraying means, I should say the problem was more than half solved, but it is extremely difficult to do it.

The synthetic-resin and cellulose-acetate moulded mudguard would seem to have some promise. The latter has already been attempted with extremely pleasing results, but I do not know how they have worked out on the road. Acetate sheet is extremely strong but has not the resilience of rubber; it has definite advantages, low cost being one of them.

The only synthetic-resin type of plastic that would seem at all possible is, perhaps, a fabric impregnated with, say, a rubber-like synthetic to produce a mouldable structure which would be resilient. It would probably possess a matt surface, although it could be produced in brilliant colours.

Down Bowling Green Lane

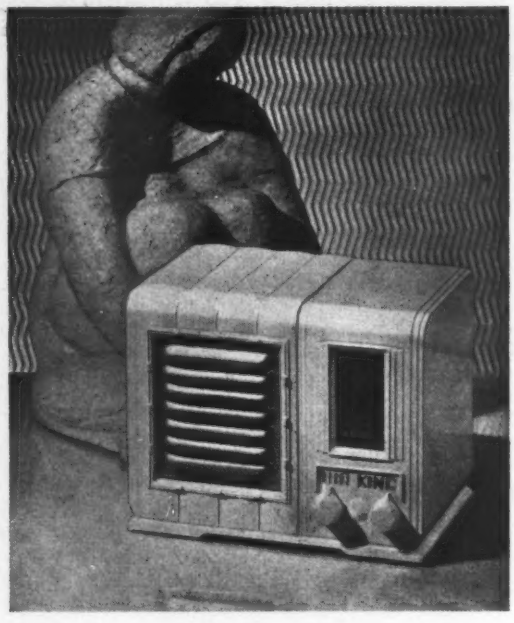
Having recently returned from the South of France, where the game of bowls is usually played along any country lane full of knobs and pot-holes, where the distances between "woods" and "jack" (they are made of steel there) are measured by the eyes, and a jaundiced one at that, where matters usually end in a fight free for all, it is pleasant to return to a country where the game is taken really seriously and the distances are measured to within a couple of "thou." Hence the real need for the Taylor-Rolph "Selfwynd" in civilized countries. It is moulded from very sturdy material by Crystalate, Ltd., and can slip comfortably into a waistcoat pocket. A little plunger, on pressure, allows the pointer and cord to be pulled out to the desired length. A spring arrangement within

allows the cord to rewind itself automatically and neatly. The pointer contains a pair of callipers for very short distances, and fits in a slot at the side of the instrument.

Spray Enamelled Radio Cabinets

A development in the production of radio cabinets that will be criticized in some British plastic circles has been adopted in the U.S.A. for some time past. A good example is that shown in the accompanying photograph of a new model produced by Air King Products Co. As will be seen, it is of ivory colour, but has actually been moulded of black phenolic resin (Durez). The ivory enamel has been sprayed on in the usual manner. One reason for the advancing use of enamel finishes on these table models is the greater ease and less expense of matching specific colours. Also, only one type of plastic is required, which helps to speed up production and maintain low prices.

The criticism that may be levelled at this method is that the main advantage of plastics is being lost sight of,



namely, that a chipping or breakage in plastics reveals no difference in colour. In the above instance, chipping of the ivory layer will expose a black colour. The answer to this criticism, we presume, will be that the enamel will not chip if it is applied properly, and, judging from modern enamelling generally, there is a great deal of truth in it.

Plaques for Stencil Making

An interesting use of plastics is suggested by a new apparatus, produced by Husson, of Paris, for forming special or complicated designs in the stencils used for mimeographing. The system is to form the desired designs in plaques moulded from phenol formaldehyde powders and transfer them to the stencil by rubbing.

The plaques used are about 9 cm. by 14 cm. and about 3.5 mm. thick. Designs, which may be anything from fancy capital letters or fancy letter words to floral designs or even figures, are left on one surface of the

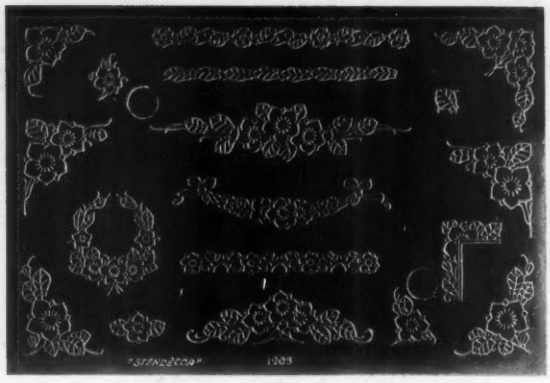


plate as a raised design. A good example is shown in the accompanying photograph.

To facilitate placing the design on the stencil, this plaque is fitted into an opening in a large base plate, marked off in centimetres in either direction. In use, the plaque is first moistened with a special liquid, which serves to dissolve the wax on the stencil sheets. The stencil is then carefully laid in place on the design to be used and covered with a sheet of celluloid 0.3 mm. thick. The stencil is then rubbed firmly with a burnisher through the celluloid, so that the sharp edges of the design in the resin plaque cut through the superimposed stencil.

Husson point out that this method of using resin plaques permits the production of special plaques to any desired design without difficulty. The die used being merely a plain sheet of steel, with the design lightly engraved in it, is easy to make, while the resin plaques offer great resistance to wear, and at the same time perforate the stencil without destroying it.

Shaping Wood

Attempts have long been made to treat wood so that a stronger waterproof material is produced. Impregnation of thin sheets with synthetic resin and then gluing together under pressure is a normal procedure in many countries for aircraft and other construction. Impregnation of solid wood blocks of considerable thickness has also been carried out successfully, although only under laboratory conditions. The vacuum and pressure plant and that for the heating and pressing processes for curing which follow presumably make this method very costly. It has also always been the desire for wood-workers to possess methods of moulding wood into any desired shape they wish. Our present method of synthetic resin moulding, which contains about 50 per cent. wood flour, may be considered by some another method of moulding wood. This is far from the truth for the resin is electrically, chemically and physically the important part of the structure. Moreover, by a sad blow of mechanical fate, we are forced to destroy partly the structure of the wood before we can use it.

A new method of treating block wood, so that it can be readily impregnated by synthetic resins and the like and ultimately moulded, has come to my ears. Wood is first submitted to the action of ammonia, by which treatment it is swollen. In this condition the pores may be filled with rubber by means of emulsions or solutions of synthetic resins of most types. While in the swollen state it can readily be moulded without apparent loss of the important fibrous structure. Some of the materials thus made look and feel like leather.

Inquiries and Answers

Celluloid Sheet

Liverpool.

The Editor, *Plastics*.

Dear Sir,—We are taking the liberty of writing to inquire if you could possibly tell us the name of the enclosed sample piece of coloured film. We should also be grateful if you could recommend any likely suppliers of this material.

We also noticed in a recent issue of your paper a reference to a form of imitation leaded-light work. Would it be possible for you to place us in touch with the owners of the process referred to?

L. KEIZER AND CO., LTD.

[EDITOR'S NOTE.—The material is unpolished celluloid sheet about 5/1,000 m. thick. Suppliers are given in our Directory. The patentee of the "leaded window" referred to is H. F. Button, 47, Rutland Court, Denmark Hill, London, S.E.5.]

Plastic for Turning and Milling

Birmingham.

The Editor, *Plastics*.

Dear Sir,—Can you inform us the best plastic material which can be machined by turning or milling into small containers which are about 2½ ins. long, 1 in. wide and ½ in. thick and recessed on the one side? White transparent material preferred.

WM. NEALE AND SONS, LTD.

[EDITOR'S NOTE.—There are two types of material available for this purpose if the plastic is to be in block form and then milled. The first is the acrylic type, of which Perspex, made by I.C.I. (Plastics), Ltd., is the best known in this country. It is more transparent than glass and is sold in block form, from which the exact size can be cut with a saw and the recess can then be milled out. This material lends itself to very beautiful decoration by milling and carving. Since it is also a thermo-plastic material, and if the case warranted it, it can be moulded first on slight heating in a rough mould to the recessed shape and finally finished. On the other hand, the exact shape can be moulded in a more perfect mould without any finishing whatsoever.

The second type of plastic which is suitable is the cast phenol-formaldehyde resin. This is obtainable in block form and is readily worked out by sawing, milling, turning, etc. It is transparent, although not so transparent as the acrylic type, nor can it be moulded. It is also supplied in beautifully coloured transparent qualities. Names of efficient turners and workers in these materials have been supplied to the reader.]

Bathroom Cabinet

Belfast.

The Editor, *Plastics*.

Dear Sir,—We have secured a patent for a new style of bathroom cabinet, which will have to be made in two qualities, de luxe model and one for cheapness. The latter is what we are most anxious about, as it will be made in tinned steel and enamelled white

Ladies will use the top as a cigarette resting place, consequently the white enamel will soon get disfigured; can you suggest a cheap plastic-sheet material to cover the top of this particular cabinet, so as not to put up the price very much, or is a substance to be procured of plastics in, say, a semi-liquid form to put over the tinned steel instead of cellulose enamel "white"?

I do not think that it would be possible to make a moulded cabinet as it must have a hinged bottom; the hinges must be on right of cabinet, as per drawing, also the top must be hinged to lift up. J. W. S. LESTIR.

[EDITOR'S NOTE.—The solution of this problem is possibly the use of a special laminated sheet (this can be obtained in most colours). This has included in its layers a thin sheet of metal, which carries heat away very rapidly, so that blistering by lighted cigarettes does not occur.

On the other hand, seeing that the cabinet is already of metal, the problem may be solved more simply by application of a synthetic resin lacquer and then stoving for an hour. The lacquer may be improved by including aluminium powder in it. Advice on this subject should be sought from manufacturers of synthetic resin stoving lacquers or reliable paint concerns. A list of these has been sent to the inquirer.

Although the cabinet (12 ins. by 16 ins. by 7 ins.) is a possible moulding job, the top and bottom would entail separate moulds, so that, economically, moulding is probably out of the question.]

Walnut Shell Flour

Rugby.

The Editor, *Plastics*.

Dear Sir,—I have been interested in an article in the June issue of *Plastics* dealing with walnut shell flour.

I am anxious to obtain samples of this material for some experiments I am carrying out, and should be obliged if you could put me in touch with a firm handling this commodity.

What I actually require in the first instance are approximate 1 lb. samples of the C (40-80 mesh) and D (80-200 mesh) grades as specified in the above article.

R. GUTHRIE.

[EDITOR'S NOTE.—You should get into touch with Mr. J. De Miranda, Weesperzijde 27, Amsterdam-O, who supplied us with the information. Alternatively, Mr. W. S. Dahl, of 30, Stanley Road, London, S.W.14, who is very much informed on most cellulosic flours, should be able to obtain them for you. I believe this latter gentleman once supplied Kew Gardens with some samples.]

Heating Resinous Compounds

Manchester.

The Editor, *Plastics*.

Dear Sir,—We require to heat a mixture of compounds at high temperature (over 200 degrees C.) in a series of pans. Would you please inform us of the best methods available for carrying this work out?

A.G.S.

[EDITOR'S NOTE.—There are several processes other than superheating steam available utilizing a vapour or fluid heating medium in a closed circuit, so that loss of heating medium is theoretically nil. Liquid mercury has been successfully employed, but in view of prime cost, weight, slight deterioration due to oxidation, its use is not wide.

The best known processes are the Dowtherm and the Merrill Systems. The first-named depends on the use of a heat-exchanging medium chemically known as diphenyl, a liquid extremely stable at very high temperatures and provides adequate heat exchange up from

210 degrees C. to 400 degrees C. The licence for this process is in the hands of the well-known chemical engineers, W. J. Fraser and Co., Ltd., of Dagenham, Essex. The Merrill System employs, we believe, specially selected high-boiling petroleum oils. Details of this process are available on application to Kestner Evaporator and Engineering Co., Ltd., 5, Grosvenor Gardens, S.W.1.

Both concerns, giving details regarding output, specific heat of materials to be melted, etc., are able to design the whole plant adequately.]

Plastic Materials for Transmitting Light

Sheffield.

The Editor, *Plastics*.

Dear Sir,—We are writing to you to ask your kind advice and help in trying to obtain details of some material which will transmit light along its length in the same manner as a stream of water.

The United Steel Companies, Ltd., exhibit at several shows and exhibitions throughout the year, and we find that Neon lighting is rather an expensive method of brightening up the stand. We have heard indirectly that some time ago you published an article concerning a plastic material which was described to serve the same purpose as Neon lighting. If you can give us the name of the firm manufacturing this product we shall be very grateful.

THE UNITED STEEL COMPANIES, LTD.
Publicity and Sales Promotion Department.

[EDITOR'S NOTE.—We believe the inquirer is referring to Perspex which, in rod, tube or sheet form, can be employed for the purpose in view and interesting direct or curved lighting effects obtained. An example was given in our June, 1939, issue in an article entitled "Piped Light," in which light, entering a curved rod of this type of plastic, was made to turn through 360 degrees and used for illumination.

The manufacturers of Perspex are I.C.I. (Plastics), Ltd., Nobel House, Buckingham Gate, London, S.W.1.]

Streamlined Tapered Tubes

Hebburn-on-Tyne.

The Editor, *Plastics*.

Dear Sir,—We are astonished to read on page 263 of the August issue of *Plastics* your editorial comment regarding the paper tube manufactured by Messrs. Ellison Insulations, Ltd., and wish to take particular exception to the last two sentences in your article.

According to the information available to us we were the pioneers of the development of this type of tube, and as a result of our contract with the Royal Aircraft Establishment in 1937 we developed a production of a streamlined tapered tube in a synthetic-resin varnish paper material. This has since been superseded by streamlined tapered tube in our "Texolex" synthetic-resin varnish fabric material, and has been in constant production since April, 1938.

You will realize, therefore, that the statement "that many attempts have been made in the past to manufacture rolls and moulded synthetic-paper tubes, but certainly without any great success" is entirely without justification. As is also Messrs. Ellison's claim to be the first manufacturers to produce tubes satisfactorily on a production basis.

Since April, 1938, large quantities of such tubes have been produced weekly and are now a standard product. These have been approved throughout manufacture by the Royal Aircraft Establishment and are used as aerial masts on various types of aircraft.

The masts themselves were exhibited at the Royal Aeronautical Society Garden Party in 1938 and at the British Industries Fair, London, in 1939, and, as far as we are aware, were the only masts of that type available at the time.

We enclose herewith copy of a photograph of one of our standard masts, which, like the one described in your article, is tapered, in addition to being streamlined, and has the added advantage that the wall thickness at the top is approximately half that at the base.

The length of the mast is 47 ins. and is 6 ins. by 2 ins. at the base, tapering down to 4½ ins. by 4½ ins. at the bore end, and is the original design manufactured by us.

In view of the above we trust that you will give the same publicity to this letter, or such extract therefrom as you desire, that has been given to the original statement regarding Messrs. Ellison Insulations, Ltd.'s tubes.

THE BUSHING CO., LTD.

Plastic Plinths

Gateshead.

The Editor, *Plastics*.

Dear Sir,—We should be grateful if you would put us in touch with your contributor Mr. Thomas S. Cunningham, whose query re a plastic plinth for statuettes appears in the August issue of your journal.

As specialists in Bakelite veneered plywood, we think that your querist would find our product ideally suited to his requirements, and small quantities can, of course, be produced without the high tool cost which is incurred by users of solid moulded materials.

We have had wide experience of the fabrication of laminated decorative sheet for this and similar purposes and we trust that, should you receive further inquiries for articles of this nature, you will be good enough to bear us in mind when communicating with your readers.

THE BUSHBOARD CO., LTD.

Translucent Sheet

In our May, 1939, issue we received an inquiry from a Government Department for a transparent or translucent sheet. A specification for it was published. We have recently received from the Richardson Co., of Lockland, Cincinnati, Ohio, a sample of Insurok in the form of a translucent sheet about 25/1000 in. thick. At sight it appears similar to urea formaldehyde, although we do not know the real composition. Even in this thin form it is extremely strong and withstands considerable flexing, to less than 45 degrees, without fracture (although it eventually does break), returning to its original flatness without undue distortion.

Developing Dishes

An inquirer wishes to know of a concern that stocks moulded developing dishes. From the moulding point of view there is no difficulty, but we do not know of any such manufacture in this country. It has been assumed in the past that the resin would affect the developing solution adversely and that it would also deteriorate on prolonged contact with water solutions. This is probably not so, for not only are there now several moulded developing tanks of the daylight type now on the market (we described one moulded by Rootes Mouldings, Ltd., in our last issue), but we understand that a South American concern is, in fact, moulding dishes from Bakelite. We suggest the reason why they are not produced here is one of economics. The inquirers are Neville Brown and Co., 44, Berners Street, London, W.1.

INSULATING SLEEVINGS

THE production of insulating sleevings is one of numerous processes of which publications are relatively rare. Plastics, however, play an important part in this industry.

Insulating sleevings are made by two principal methods; one method is the manufacture of extruded tubings or sleevings without the use of woven or braided textile materials. Although this method is the most modern one, it has not yet reached the importance of the varnished insulating sleevings on textile base. It is doubtful whether these extruded sleevings, with the exception for special applications and for non-electrical uses, will ever supersede the impregnated and varnished textile bases.

The most interesting insulating sleevings of this description are materials extruded from polyvinyl acetates and copolymerization products of polyvinyl acetates and polyvinyl chlorides and other special thermo-plastic materials. Such sleevings are superior and extremely interesting with regard to their high electrical properties and their resistance to acids, alkalies, oils and other chemical attacks, with the exception of a range of solvents; their weakness, however, lies in the fact that their heat resistivity is very poor, and that, therefore, such sleevings cannot be used for numerous applications, and that even soldering in mass production of wires inserted in such sleevings gives rise to a lot of difficulty, especially in the wireless industry.

Considerable improvements in this respect can be obtained by using condensation products of polymerized vinyl derivatives with aldehydes, such as acetaldehyde, formaldehyde and butaldehyde; these products are not so resistant to chemical attacks, but have excellent electrical properties and permit applications under elevated temperatures even up to 150 and 200 degrees C. There are some difficulties in suitably plasticizing and extruding these new materials, which, however, are likely to be overcome fairly easily.

Further compounds which have just found their way into experimental manufacturing are combinations of polyisobutylenes with other synthetic resins and fillers. These polyisobutylenes are known, for example, under the trade name of Oppanol. The materials have superior heat resistivity and do not need plasticizers, and are very interesting because of their excellent power factors; they can be called low loss materials. Here the difficulty is to find suitable combinations which will allow to extrude these materials in self-supporting sleevings without decreasing their tensile strength and mechanical properties. Oppanols generally suffer by possessing marked cold flow, and so tend to lose shape in time; these disadvantages have now been overcome by calendering or roller mixing these Oppanols together with polymerized ethylenes, which latter synthetic products will be on the market in bulk quantities at the end of this year.

Polymerized ethylenes manufactured, for example, under the trade name of Polythene by I.C.I. have excellent electrical properties too, and are not attacked by any solvents in the cold. These new compounds are now being carefully considered by well-known cable companies and also the G.P.O. Research Station. Compounding polyethylenes with polyisobutylenes has yielded some very useful compounds, which, in particular, do not lose by this combination their high electrical values and their low loss properties.

Whilst the above-mentioned extruded insulating sleevings are, without doubt, developments of the plastics industry, the insulating varnished sleevings and tubings are more or less long-known developments of combined efforts of the textile industry and the paint and varnish industries. In principle, cotton or silk braids are impregnated and coated with drying oil varnishes and additional coatings of oil-modified resins of the phenol and/or glyptal types. Such sleevings are made in cut lengths by dipping the textiles wound round frames, or in drying towers, by a continuous process. Baking each layer for several hours is necessary, and the two to six varnished coatings must be very thin to achieve thorough drying and flexibility of the finished product. The sleevings have fair electrical properties, but are superior with regard to their heat resistivity. Many years of experience have been necessary to find oil-modified resin varnishes of the necessary flexibility, and the sleevings generally harden by ageing, and lose their colour by darkening unless they are pigmented.

The plastics industry, with the exception of the manufacturers of drying oil-modified resin varnishes, have only in recent times investigated and developed considerable improvements with regard to insulating sleevings of this type.

The developments of soft and pliable woven and braided fabrics from glass "fibre" have presented a material which is very much superior, although more expensive, than textile or even silk fabrics, especially with regard to water absorption and non-burning properties and resistivity to elevated temperatures. It is obvious that using woven glass as a base for insulating varnished sleevings, a varnish had to be developed which does not burn. Almost perfect sleevings with regard to their flexibility, mechanical properties and electrical values have been made recently by covering woven glass sleevings with suitably plasticized varnishes made from polyvinyl chlorides and polyvinyl acetals. It is obvious that the polyvinyl chloride products do not burn, and being superimposed on to glass are not very much affected by elevated temperatures. With regard to heat resistivity, however, polyvinyl acetals and condensation products of vinyls with formaldehyde are superior, and by choosing special plasticizers, for example, chlorinated diphenyls, tricresyl phosphate and other suitable non-burning mixtures, even these varnishes and lacquers can be prepared in such a way that they do not support combustion.

This development also permits interesting products on woven asbestos. Besides the fact that these insulating sleevings are of great value for the electrical industries in general, they open a new field of applications for which the sleevings hitherto known could practically not be applied; this is their use for heating pads and similar applications where resistance wires under moderate heat have to be electrically insulated and protected from moisture without losing the flexibility of the finished unit.

Manufacturers of domestic electrical appliances are now showing some considerable interest in these materials and they are likely to be in good demand.

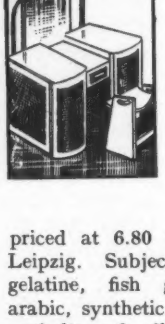
WORLD'S INDUSTRIEM

CHEMICAL

Carbon or graphite binding to form plates and tanks for chemical processes is improved by the utilization of synthetic resin bonds, according to *The Manchester Guardian* (August 4). Amorphous carbon is first made by treating carbons with coal tar under pressure and high temperature. The material is then treated with synthetic resin to eliminate porosity, pressure and temperature being again employed to cure the resin and form solid plates. Since the physical properties of the finished material are very little different from pure carbon, it is recommended for the construction of pipes, tanks, etc., carrying corrosive liquids. **American Society of Testing Materials** (U.S.A.) has worked out two test methods covering index of refraction of transparent organic plastics and resistance of plastics to organic chemical reagents. The former applies to cast, hot-moulded and sheet materials. Refractometric and microscopic methods are proposed to cover maximum range of indices. Scope of test for resistance to chemicals covers cast, hot-moulded, cold-moulded, laminated and sheet materials, and includes provision for reporting change in weight, dimensions and appearance, but not in strength, electrical properties, etc. Effect on these properties should, it is stated, be determined on the standard specimens for such tests before and after immersion in the reagents. Also recommended that impact strength of the plastics should be determined before and after immersion.

MOTORS

Motorcar bodies of plastics are now being tested according to an American source. It is reported that considerable progress in developing and using a new plastic, designed to be an important material in motorcar construction, has been made by the Briggs Manufacturing Co., makers of motorcar bodies, says Reuters Trade Service from New York. The new material is claimed to have a greater tensile strength than steel and to be tough without being brittle. Officials expect that each year will see a greater part of the motorcar being made of plastics. It is estimated that bodies of the new plastic will weigh only half as much as those of steel, and will be much less costly. "Steelplast" is the name given to the new substance. It is not a laminated material, but contains wood fibre. When still in slush form the fabric is polarized, a treatment through which the fibres are laid lengthwise. The "monosteel" type of construction, pioneered by the Briggs Co., is to be used in the plastic bodies. This eliminates the conventional frame, and the body will thus be a self-supporting unit made entirely of "Steelplast." **A demonstration motorcar** with the top made entirely of transparent plastic has been built for the Chrysler Corp. for display at the New York World's Fair. **Automobile springs** made from a combination of steel and an outer casing of rubber are being made by an American company. Rattles and other noises are completely eliminated, it is claimed, while lubrication is not necessary. **Tachometers** with housings and rollers made from moulded resins have been placed on the market in Germany by VDO Tachometer A-G., Frankfurt-am-Main.



FURNITURE

Synthetic glues and cements are fully described in a new book, "Kitte and Klebstoffe," just published in Germany. The author is C. Brener and it is priced at 6.80 rmk., Max Janecke, Leipzig. Subjects dealt with include gelatine, fish glue, dextrin, gum arabic, synthetic resins, rubber glues, asphalts and cellulose cements. **Compounded wood** now used by American furniture manufacturers states the Industrial Bulletin of Arthur D. Little, Inc. Wood unsuited for many construction purposes becomes the core of the plank and laminated layers supply the exterior. The proportions of each are varied so that the same characteristics can be repeated at will. In part, the use of phenolic resins as the gluing agent in the finished board is the difference between the older veneered panels and the new beams of technologic mill working. The various layers of wood are arranged in "books," dried, coated with resin, heated electrically and finally pressed at proper temperatures into finished lumber. These boards meet predetermined specifications, with widths previously unavailable and with a uniform adherence to specification comparable to that of the steel construction industry. **Protecting valuable furniture** by means of cellulose acetate sheets was carried out by the Earl of Jersey in his magnificent residence, Osterley House, near Isleworth, Middx., which was, until war was declared, open to the public. The material used was Rhodoid, and Lord Jersey made full use of its transparency, non-cracking and pliable qualities by covering the front of valuable Adam console tables down to the floor. This effectively protected them from finger marks and any other damage likely to result from people continually moving past. Open-fronted bookshelves were also treated in this way. The sheets of Rhodoid were made secure by small pieces of wire which were practically invisible and the fitting so arranged that instant removal of the material was possible.

AGRICULTURE

Cattle breeders and dealers as well as butchers, showed great interest in the lamb carcases and poultry wrapped in "Cellophane" cellulose film, which were exhibited by British Cellophane, Ltd., at the Bath and West Show in May. Two methods of wrapping lamb carcases were demonstrated by the company. For home trade, a large, single-sheet type of wrap was recommended. For export from the Colonies, the use of a 5-in. reel of film was advised, the carcase being completely swathed, bandage fashion, from the neck to the hind quarters. This type of wrap will withstand handling better than the former. Tests conducted by Bowerman and Son, well-known Taunton butchers, have clearly established that lamb carcases thus wrapped in "Cellophane" film retain the bloom of freshness for an appreciable time. Another significant fact is that film-wrapped carcases do not lose weight due to evaporation to the same extent as carcases wrapped in cloth: by comparison the former tip the scales by 1¼ lb. over the latter. The poultry wrapped in "Cellophane" film made an instant appeal to breeders and dealers alike. The public also commented most favourably on the exhibit and was quick to appreciate the value of transparent wrappings for poultry, the combination of hygiene and visibility peculiar to this type of wrapping

EMPLOYS PLASTICS

being obvious to potential consumers. Poultry and carcase wrappings in "Cellophane" film are new developments in this country and offer great possibilities of increased business to enterprising breeders and dealers.

GENERAL ENGINEERING

Attaching rubber to metal is described in a recent British patent 498,649. Iron or steel supports to be embedded in a latex adhesive layer between two fabrics are treated to convert the surface layer into ferrous sulphide to facilitate adhesion of the latex. **Rubber bearing material,** made of both natural and synthetic rubber, now being extensively used in modern industry. According to *The Industrial Chemist*, August, 1939, there has grown a need for a suitable lubricant for rubber bearings, bushes, shackles, etc., and colloidal graphite is now finding favour. Colloidal graphite, as a dispersion in water, has for some time proved of great value in rubber bearings and, prompted by this and other experience pointing in the same direction, a patented lubricant has recently been developed consisting of the "dag" product in glycerine and water. The glycerine and water, themselves lubricants, act as a carrier for the microscopic, slippery particles of graphite. The latter form a slippery surface on the rubber, which provides not only highly efficient, but lasting, lubrication. In addition, however, the rubber is protected from much oxidation and from abrasive wear and kept in good condition. Being extremely small, the particles of colloidal graphite can penetrate into interstices such as joints and connections, so preventing squeaking, an important factor in automobile spring shackles. **Coating moulds and cores** for casting nickel-aluminium-steel, stainless steel, manganese steel, bronze, or other metal, can be carried out with a new preparation made of foundry sand, graphite and hardenable synthetic resin. British Patent 506,770 describes the preparation of such a mixture. One part of phenol is dissolved in 1.5 to 3 parts of wood oil and the solution then mixed with twice its weight of graphite to form a paste which is used to bind nine times its weight of sand. If a siccative, such as manganese dioxide, equal in weight to 2 per cent. of the weight of the oil, is added, drying without baking is sufficient. One part of phenol resin, 1.5 of graphite, 0.02 of lead-cobalt-manganese resinate, mixed with 3 to 6 parts of puzzolana or mica and powdered silicious or argillaceous earth, may be used for coating. Three to five parts of phenol resin, mixed with 3 to 6 parts of graphite and 92 parts of sand, may be used for making cores, which are baked at 160 to 200 degrees C.

ELECTRICAL

High - tension cable is insulated with new ethylene resins made by Imperial Chemical Industries, Ltd., according to B.P. 505,762. **Electric-lamp supports,** such as a wall fitting or a standard, can, according to B.P. 505,361, be made of a thermoplastic insulating material, such as cellulose acetate, benzyl cellulose or polymerized vinyl ester, in which are embedded the conductors required for conveying current to the lamp. The conductors may be embedded in the material by placing them on a preformed strip of the material in a mould and then filling the mould with thermoplastic moulding powder, which is subsequently moulded under heat and pressure on to the preformed strip. The lamp holders may be moulded in at the same time. **Electrosurgery and diathermy** is making increased use of plastics and the new Ultriplex machine reveals a very interesting use for Durez phenolic resin made by General Plastics Inc., U.S.A. The largest moulded part is a cage-like rectangular piece which forms the actual body contact. When attached to the handle-shaped unit, also moulded, it forms a holder for electrodes. This framework is adjustable so that the electrodes used in treatment of sinuses, for instance, may be kept properly spaced from the face. The Durez acts as an insulator, is easily sterilized and kept clean. holds its high polish and is not readily affected by temperature changes. Being very light in weight, it is not cumbersome to manipulate and is easy for the physician to adjust. Eclipse Moulded Products Co., of Milwaukee, U.S.A., are responsible for moulding the Durez parts for the Ultriplex. **Battery plate separators,** fillers, electrolytic cells and the like can, according to B.P. 504,549, be made from heat-hardenable materials such as reactive phenolic or urea resins rendered microporous by the addition of a highly hydrous oxide gel, such as a silicic acid gel containing 15-40 per cent. SiO_2, and hardening under non-evaporative conditions.

MISCELLANEOUS

Matrices for sound records can, according to B.P. 505,579, comprise a base composed of a heat-hardenable synthetic resin and a filler consisting partly of long matting fibres and partly of short matting fibres and a surface layer of moulding material composed of a heat-hardenable synthetic resin and a filler, e.g., wood flour. **Gas masks** made by direct deposition from aqueous dispersions of rubber are described in B.P. 505,726. **Utilizing waste rubber** from scrap vulcanized rubber described in B.P. 505,156, taken out by Soc. Italiana Pirelli. The rubber is recovered from scrap vulcanized rubber by impregnating the scrap with a swelling agent until it is friable, grinding the friable scrap in a ball mill or the like to reduce the rubber to a fine powder, and the fibrous material to a condition in which it is readily separable from the rubber, mechanically separating as by sieving the fibres from the rubber powder and recovering the swelling agent from the ground material. The grinding and sieving operations may take place in stages and the grinding mills and sieves closed with gas-tight covers and connected so that a current of inert gas may be passed through the plant to facilitate recovery of the swelling agent. **Typewriters** and other mechanical office equipment are being constructed in Germany, largely of moulded synthetic resins. Report in *Kunstoff-Technik* (August, 1939), described a number of pressings which are utilized by the Olympia-Büromaschinen A.G. for the mass production of typewriters. A large proportion of the framework of the machines, such as bars, keys, slot-beds, etc., are moulded parts. **New display turntable** has a moulded housing and is now being widely used by American shopkeepers. Waterbury Button Co., Waterbury, Conn., U.S.A., have these units available from a stock mould. Base of the housing is 4 ins. in diameter; top is $3\frac{7}{8}$ ins. All movement is eye-catching and the turntable permits a full view of every side of the displayed item.

PRODUCTION

Practical Information dealing with Raw Materials, Moulding and Forming of all types of Plastics—Thermo-Hardening and Thermo-Plastic—Works-Organization, New Plant and Control Apparatus

NOTES AND COMMENTS

Luminous Plastics

NEARLY two years ago we first mentioned that luminous moulded objects were appearing on the English market and that French and Belgian moulding powders were available. Many British moulding concerns were interested, but since supplies were not readily obtained, nor were moulding difficulties negligible, little progress was made. To-day, however, matters have improved very considerably, for Campbell Industries, Ltd., of Hibernia Chambers, London Bridge, London, S.E.1, are now in the position to make deliveries of the luminous compound (special barium sulphide activated with strontium) to be made into moulding powders. This company markets the material under the name of Luminophore. What is also very pleasing is that James Ferguson and Sons, Ltd., the well-known manufacturers of phenol-formaldehyde and urea-formaldehyde moulding powders, have received the sole licence from Campbell Industries, Ltd., to produce the luminous variety. At their factory near Colliers Wood the research staff have been working out the optimum conditions for the moulding of the luminous compound and urea-formaldehyde mixture. The results of this work have been highly successful, and several well-known moulding companies are using the powder for mass-production work.

In France the luminous material as paint or as mouldings is being widely used, especially by the Army, Navy and Air Force. It is also common in the Air Raid Precaution system there, battleships, forts, bridges, tanks and artillery making proper use of luminous moulded plates. We have received a little data regarding the moulding technique. The moulding powder containing Luminophore must be perfectly dry and must be preheated for 20 to 40 minutes at about 100 degrees C. The moulding should be carried out in chromium-plated moulds at 3,000 lb. per sq. in. for flat plates and about 9,000 lb. per sq. in. for curved articles. The time given is about 2¼ minutes for thicknesses up to 3 mm. Contact with lead or lead compounds during storage or working must be avoided, otherwise blackening due to lead sulphide will take place.

We await with interest the type of manufacture that will take place in this country. We hope that there will be a considerable amount of Government work for the industry on the lines carried out in France. At present several concerns are moulding switch covers and similar articles for what might be called A.R.P.

A Happy Combination

AN outstanding event in the plastics industry is the announcement that the Distillers Co., Ltd., has concluded an arrangement with the British Xylonite Co., Ltd., to take a half-interest in B.X. Plastics, Ltd., the wholly owned subsidiary of the British Xylonite Co.

The Distillers Co., in addition to its other well-known activities, such as alcohol and acetic acid manufacture, produces a number of raw materials used in the manufacture of plastics, and has recently undertaken considerable research work in the plastics field, of which the most interesting result is the synthetic resin Distrene, a plastic of the styrene group.

The British Xylonite Co. has been in the plastics industry for more than 60 years and controls five subsidiary companies. The largest subsidiary is B.X. Plastics, Ltd., which manufactures Xylonite, Bexoid (cellulose acetate), Lactoid (casein), moulding powders and film. The other subsidiaries manufacture finished goods from materials supplied largely by B.X. Plastics, Ltd. One of them, Halex, Ltd., produces the well-known Halex brand of tooth-brushes and toilet goods.

The combination of the large financial resources, chemical manufacturing experience and research facilities of the Distillers Co., with the long and successful experience of the British Xylonite Co. in the production and sale of plastics, will be of major importance in the British plastics industry.

May we express our great pleasure at this agreeable joint action? The Distillers Co. may be known to most as producers of well-known alcoholic beverages. To the scientist, and more particularly the chemist, it is known for its work on industrial alcohol, synthetic acetic acid and a host of other chemicals derived from these by catalytic action. It was as a direct result of this chemical work that Distrene was produced. Both at Hull and at Epsom this company has the research stations which will prove so useful to the plastics industry of the future.

As for the British Xylonite, Ltd., the industry knows it sufficiently well. Although also highly scientific (its researches on cellulose, esters of cellulose and synthetic camphor are well known), it possesses the inestimable advantage of a highly organized sales department that is world famous. We wish the combination the best of fortune. It is of first importance to the British Plastics Industry.

TRADE AND PERSONAL NOTES

"Steel Helmets for Industry." This is the title of a broadsheet issued by the Lord Privy Seal, July 10, 1939, in which it is stated that the Home Office is arranging to sell to public utility undertakings and industrial and commercial concerns the steel helmets which they will require for their air-raid precautions services in compliance with their prospective obligations under the Civil Defence Bill. These helmets, which are to War Office Specifications and passed by War Office Inspectors, will become available immediately at the rate of 100,000 a week. The price of the complete helmets will be 8s. 6d. each carriage paid to any address in Great Britain. Orders for helmets from industrial and commercial concerns should be forwarded on a special form, H.I., which is being distributed through trade associations of employers, etc.

British Standards Institution, 28, Victoria Street, London, S.W.1, inform us that they are planning to issue British Standards for A.R.P. requirements at the request of the Home Office Air Raid Precautions Dept.

The preparation of these Standards will be under the control of a special Advisory Committee and in accordance with the usual practice of the B.S.I., will be carried out in the closest co-operation with Government Departments and the Industry concerned.

Thos. Firth and John Brown, Ltd., Atlas and Norfolk Works, Sheffield, 1, have forwarded us a superbly produced souvenir brochure issued in connection with the visit to their works of the Forfeit Feast Guests of the Master and Mistress Cutler on July 5, 1939. It might be pointed out that the Forfeit Feast is one of the outstanding events in the Master Cutler's year of office and it is usual for the guests to this Feast to visit important works in the city of Sheffield on the following day. In our opinion this brochure is one of the finest and most comprehensive trade publications we have yet had the pleasure of reading.

Howards and Sons, Ltd., Ilford, have informed us that their telephone number has been changed from 1113 Ilford to Ilford 3333.

The Board of Trade announce that the Standing Committee (General Merchandise) have reported on their inquiry as to whether imported goods of the following descriptions should be required to bear an indication of origin:—Buckles, slides and clasps, made wholly or mainly of wood or plastic materials for use with wearing apparel; and buttons of all kinds. The Report is being published, and copies may shortly be purchased either directly from His Majesty's Stationery Office, at the following addresses:—York House, Kingsway, London, W.C.2; 120, George Street, Edinburgh, 2; 26, York Street, Manchester, 1; 1, St. Andrew's Crescent, Cardiff; 80, Chichester Street, Belfast; or through any bookseller.

BX Plastics, Ltd., a subsidiary of The British Xylonite Co., Ltd., have sent us a folder enclosing five booklets describing Bexoid. The first publication gives details of the physical properties of the material, general characteristics, etc.; the second treats of practical methods of working Bexoid, such as bending, cementing, cutting, drilling and punching, etc.; the third booklet describes bending, blowing, embossing and moulding, and the fourth is concerned with covering, decoration, dyeing, etching, fixing panels, printing, stitching and storing. The fifth publication deals exclusively with suggestions for ordering and the minimum quantities available, etc. This collection of practical data should be of the greatest interest and value to workers in acetate, and manufacturers are advised to apply to BX Plastics, Ltd., Hale End, London, E.4, for copies.

Lorival Manufacturing Co. (1921), Ltd., Little Lever, near Bolton, Lancs, inform us that, owing to amalgamation with United Ebonite Manufacturers, Ltd., they are now trading under the name of United Ebonite and Lorival, Ltd., Springside Works, Little Lever, near Bolton, Lancs. Telephone number Farnworth 676/677.

British Industrial Plastics, Ltd., have sent us the summer number of *The Beetle Magazine*, which, as usual, is full of interest and contains a number of well-illustrated and topical articles, particularly the one entitled "Soldiers of 1939," which deals with our efforts of national defence.

G. Beaton and Son, Ltd., Beatonson House, Victoria Road, Willesden, N.W.10, are acquiring the controlling interest in E.H. Fuel Injection, Ltd., of Harlequin Avenue, Brentford. It is intended immediately to increase the manufacturing facilities of this latter company and that their principal activities will continue to be the development and production of fuel pumps, high-pressure hydraulic pumps and equipment. Mr. Stuart C. Goodwin and Colonel Leslie Sadler are joining the board of the company.

The British Cellophane, Ltd., have sent us the August issue of *20th Century*, the magazine of British Cellophane, Ltd., which contains a number of well illustrated and very interesting articles. There is a packaging supplement made up of a series of excellent photographs of new packs created by the Package Development Department of British Cellophane, Ltd.

Apex Construction, Ltd., Swan House, 133-135, Oxford Street, London, W.1, have sent us their new publication describing improved pharmaceutical equipment made by F. J. Stokes Machine Co., Philadelphia, Pa. Copies are available and application should be made to the London address of the company.

The Ideal Home Exhibition for 1940 will be held at Olympia, Kensington, W., from April 2 to April 27, 1940. Details of exhibiting space available are obtainable on application to the Organizer, Geo. H. Grimaldi, *Daily Mail* Ideal Home Exhibition, New Carmelite House, London, E.C.4.

Association of British Chemical Manufacturers has recently issued Safety Circular No. 92, which describes a fatal gassing accident due to a leaking valve. The accident illustrates the necessity of completely disconnecting and blanking off, from all possible sources of dangerous gas, any plant that is to be entered, unless the person entering is wearing suitable breathing apparatus.

British Rayophane, Ltd., report a trading profit of £31,775 compared with £26,769 and a net balance of £12,739. The debit balance of £12,296 brought forward is extinguished and a credit balance of £442 carried forward. Bank overdraft is reduced from £8,488 to £5,019.

The Airscrew Company, Ltd., report a net profit of £31,688, an increase of 41 per cent. over the figure for the previous year. At the ninth annual general meeting, July 14th, 1939, Mr. J. D. Titler, chairman, stated that the recently formed subsidiary, Jicwood, Ltd., yielded only a small gross profit from the date of incorporation, January 8, 1938, to March 31 last. After charging technical and administrative expenditure and writing off adequate depreciation, a net trading loss has resulted. The trading position of the company has now, however, improved very considerably.

Cascelloid, Ltd., celluloid goods manufacturers, of Abbey Lane, Leicester, have decided to establish a new and additional factory at Stamford, Lincs. This will be the third factory owned by the company, the second one being near Coalville, Leicestershire. The Stamford factory will provide employment for about 150 girls and will be used as an assembly factory for the various parts manufactured in Leicester.

NEW MATERIALS—NEW PLANT—NEW METHODS

THE ALMARCO ABRASIVE DISC CUTTING-OFF MACHINE

ALTHOUGH primarily intended for cutting off large quantities of sections of every description within its capacity, this machine, made by Almarco, Ltd., Wellingborough, is also of great service where small quantities of varying shapes and lengths are required. It cuts speedily and accurately and leaves a surface so smooth that usually there is no need for further finishing. All types of materials may be cut, including plastic sheet, rod, etc.

The abrasive wheel is moved into the work by means of a hand lever fitted at the front of the machine. This arrangement allows the operator to fix the hand lever in the most suitable position. The machine has been specially designed for wet or dry cutting. Both methods have their particular advantages, but the wet process is recommended whenever it is convenient. By wet cutting the wheel not only lasts longer, but cutting is performed quicker and better, with

Close-up of the Almarco disc cutting machine.

absence of burrs. A further additional advantage is that all abrasive dust, etc., is immediately settled by the water supply.

The spindle is of high-tensile steel and runs in Skefko ball-bearings specially designed for high speeds, the whole being fully protected against dust. The head is very robust and free from vibration, which adds considerably to the life of the abrasive wheel, which is held in position between two large, accurately balanced flanges. Two sets of the latter, in different sizes, are furnished to ensure the maximum use of the abrasive wheels. The abrasive cutting-off wheel is adequately guarded for the protection of the operator, and the door gives quick and easy access to the wheel. The guard completely encloses the wheel excepting for the necessary stock opening. This safety device is calculated to prevent a number of accidents.

Provision is made for the small pieces being cut off, together with the waste, to pass through an opening in the table to the inside of the body of the machine, where a suitable and quickly removable receptacle is provided for returning the work and, at the same time, allowing the waste to run into the lower portion of the body, where a screwed pipe is provided for making a suitable connection to the drain.

The work stop bar, upon which the stop slides, is rigidly held by a bracket. There is no limit to the cutting-off length of the stock. The gunmetal slide bar is ¾ in. in diameter and the one supplied with the machine can be easily replaced by a longer bar should this be necessary. The gunmetal stop is arranged so that final fine adjustments may be made for accurately cutting off, to dead lengths, from nil upwards. This is a great convenience which will be readily appreciated by fabricators in the plastics and consumer industries.

A conveniently placed depth stop is provided in the form of a well-balanced hand wheel working on a vertical, square-threaded gunmetal screw, and this hand wheel will automatically remain in any desired position, so that the abrasive wheel may be arrested in its downward path at any given depth if desired instead of passing completely through the work. A further adjustable stop is also provided so that the cutting edge of the abrasive wheel may be set at any distance above the work. When necessary, work-clamping devices can be supplied to suit all kinds of sections. The oscillating frame, or yoke, is extremely sensitive in operation and after the wheel has passed through the work returns automatically to its normal position.

The 380/440 V, 50 C, 3 P motor is controlled by a hand-operated star delta starter placed in a very convenient position and within easy reach of the operator.

FINISHING OF MOULDED PARTS

The July issue of *Durez Moulder*, issued by General Plastics, Inc., U.S.A., contains a most interesting practical article dealing with the buffing, cleaning and polishing of mouldings. The use of different types of buffing compound seems to have quite a bearing on buffing costs. Tripoli polish, however, leaves a somewhat greasy finish that has to be wiped off, although, of course, there are some jobs where such wiping is not necessary. Some moulders swear by luminite number one, luminite white or black. Others use nickel lime, but care must be exercised in determining whether the piece is of a design which permits complete removal of this polish. Any ridges or grooves which catch and hold the polish will show the lime slaking off just about the time the finished parts reach the customer. Removal of the white lines is expensive.

Types of wheels vary with the job and piece to be finished. Speed of operation as well as wheel hardness have an important bearing on use, life and cost. Building up wheels for longer service is practised in some plants. A hard, sewn buff, with the flat surface soaked with a buff wheel glue, has proved a long-lasting wheel. It is easily cleaned and straightened or tapered with pumice stone. Pocket wheels appeared a few years ago which have an excellent cutting surface and last longer than standard wheels. For smooth-surfaced parts they are excellent. Tumble polishing is a good method on large production runs where one operator can attend to 10 or 20 barrels. Copies of the *Durez Moulder* may be obtained by readers on application to General Plastics Inc., North Tonawanda, New York City, United States of America.

Publications Received.

"Physical Constants of Hydrocarbons." Vol. I. Paraffins, Olefins, Acetylenes, and other Aliphatic Hydrocarbons. By G. Egloff. Pp. 403. New York: Reinhold Publishing Corp.; London: Chapman and Hall, Ltd., 1939. 45s.

"Rayon and Staple Fibre Handbook." By H. R. Mauersberger and Dr. E. W. K. Schwarz. Third enlarged edition. Pp. lxiv + 832. New York: Rayon Handbook Co. $4.50.

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TERMS.—Monthly accounts, strictly net; due when rendered.

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All Editorial communications and copy should be addressed to the Editor, and must reach him not later than the 24th of the month for the next issue. MSS. or drawings which are not considered suitable will be returned if stamps are enclosed, but the Editor does not hold himself responsible for the safe keeping or the safe return of anything submitted for his consideration.

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